Marine Review

SHIP OPERATION SHIPBUILDING CARGO HANDLING

The National Publication Covering the Business of Transportation by Water

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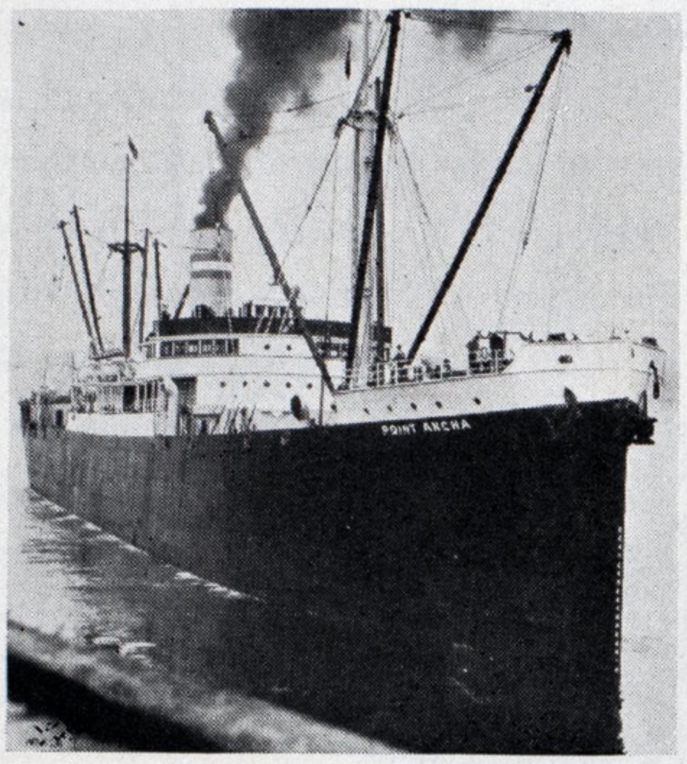

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Marine Review

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SHIP OPERATION - SHIPBUILDING - CARGO HANDLING

Volume 63 **November, 1933** **Number 11**

The Real Issue Before the Senate Committee

THE American people, through its representatives in congress, has overwhelmingly decided, by legislation phrased in unequivocal terms, beginning with the shipping act of 1916 under a democratic President and further strengthened in the acts of 1920 and 1928, that this country shall have a merchant marine. We cannot have a merchant marine without some form of government aid. That such aid is necessary is not a matter of opinion. It is therefore of vital interest to the American people that the issue shall not be confused by any disclosure the senate investigating committee may develop of misconduct, irregularities, extravagance or inefficiency on the part of any individual concerned, in executing this definite national objective. Everyone will condemn any act by any individual, whether he be an agent of the government or a private individual, showing faithlessness or inefficiency in the trust imposed in him, and action should be taken to correct any such situation.

The committee is fully justified in bringing these facts to public attention. It should, however, serve the interests of all the people of this nation by not being swayed by these disclosures to play into the hands of interests inimical to an American merchant marine and who for selfish purposes would like to see it wiped off the seas.

The primary issue before the committee is whether it shall recommend to the congress a defeatist policy for our merchant marine or to continue our declaration of independence on the high seas. It is proper and fitting that views of men who have spent their lives in shipping should be heard. F. A. Bailey, vice president of the Matson Naviagtion Co., in a recent statement said in part:

"If we are to have a merchant marine we must have government aid or government ownership. We have tried government owership with disastrous results—construction cost totaling almost $3,000,000,000 and operating losses as high as $50,000,000 a year. We have also tried doing without a merchant marine and have seen 91 per cent of our commerce carried in foreign ships and our navy dependent upon foreign vessels for auxiliary support.

"American ships cost from 50 to 100 per cent more to build and a third more to operate than similar foreign vessels due to America's higher standard of living. . . . The $20,000,000 a year now received by American shipowners preserves a fleet of several hundred vessels, giving regular service, at equitable rates, over 44 essential trade routes. The government's policy has also resulted in the construction of 42 new vessels costing in excess of $200,000,000. We should remember that the government is not interested primarily in the carriage of mail, but in the building of American ships and their regular operation over routes deemed necessary to the development of foreign commerce.

"Faced with this vital situation, it would be a fatal mistake to confuse the real issue with any petty acts of misconduct or minor misjudgments in administration that may be brought out at the senatorial hearings. . . ."

Roger D. Lapham, president of the American Hawaiian Steamship Co., speaking recently at Baltimore said in part:

"No honest man will condone any irregularities that may be uncovered. . . .

"It is not generally known that the American taxpayer, prior to 1928, had been spending millions to finance the operation of ships in foreign trades. This was needed to cover the losses of vessels operated by the shipping board. I am certain that the present policy has proved an actual economy over the era of government operation. It would be proper for the senatorial committee investigating the mail contracts to develop all of the facts and figures in this connection before passing judgment upon the performance of private operators."

Propeller Club Convention Held at Pittsburgh

The seventh annual convention of the Propeller club of the United States closed at Pittsburgh, Oct. 14, after several days session. Arthur M. Tode, New York, was re-elected president of the club and J. H. Godwin, Hampton Roads, Va., was chosen treasurer. Harold J. Harding was named national secretary. The following vice-presidents were elected: S. E. Smith, Buffalo; C. N. Bean, New Orleans, J. C. Merrill, Jacksonville, Fla.; C. H. Carland, Seattle; and A. J. P. Vandermyn, Pittsburgh.

The Pittsburgh chapter, host to the seventh annual convention, offered its hospitality for the eighth annual gathering next year.

The convention was held at the William Penn hotel in Pittsburgh and was attended by several hundred delegates and visitors. A banquet and ball was held the night of Oct. 13 at the William Penn hotel.

In the final session of the convention, delegates went on record as encouraging the construction of naval vessels in private yards and the reservation of navy yards for repair and maintenance work only. They also opposed the ratification of an ocean-going canal in the St. Lawrence river and recommended abolishment of the Panama Railway Steamship line, which is owned and operated by the war department.

Study Shipping Codes

In the month that has elapsed since reporting that the American Steamship Owners association presented its code of fair practice on Sept. 25, Administrator W. H. Davis and his colleagues have been busy preparing for hearings.

In the meantime on Oct. 18 a meeting was held in Washington, on the initiative of the recovery administration, of employers of labor engaged in loading and discharging vessels, for the purpose of considering a code for their branch of the industry. It will be decided later whether this shall be a separate code or merged with the general shipping code.

The Lake Carriers association through its counsel, Newton D. Baker, on Oct. 23 presented to Mr. Davis a shipping code for the Great Lakes. It is thus seen that the matter of a code or codes for the shipping industry is moving in an orderly fashion toward a final solution.

Commerce at Los Angeles Shows Increase

Commerce through the port of Los Angeles for the month of September, was $10,000,000 higher in value than in September, 1932, and also was slightly more in volume. The value also was greater than in the previous month of August.

These gains are primarily in intercoastal trade which show a decided upturn in both outgoing and incoming freight. Coastwise trade also showed a slight improvement both in and out.

Exports, however, were considerably less than they were in September, 1932, the gains of the preceding two or three months not being evident in September, 1933. Imports, however, were a little above what they were a year ago. Total commerce through the port amounted to a little less than 1,500,000 tons in volume, and were $72,600,000 in value.

Lumber receipts were 50 per cent greater than they were a year ago, but were not up to the figures of July and August. September receipts of lumber were a little in excess of 40,000,000 board feet. The total for the nine months of 1933 is 80,000,000 feet above the same period of 1932.

Government Program Underway-Orders Being Placed

SO MUCH has been said concerning the great government program in shipbuilding and other maritime projects that it will be interesting to note that it is rapidly being translated into actual order for materials and equipment required.

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ELECTRICAL and other equipment at a cost of over $1,000,000 has been ordered from the Westinghouse Electric & Mfg. Co. for the six 1500-ton United States navy destroyers contracted for with private shipyards. The equipment includes condensers, air ejectors, forced draft blowers, pumps, switchboards and other electrical auxiliaries. About one-half of this equipment will be built at the Westinghouse East Pittsburgh works and the remainder at the company's South Philadelphia, plant.

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THE Cooper Bessemer Corp., Mt. Vernon, O., has received an order for twelve diesel engines from the government for installation in coast guard boats. The bid price was $158,200.

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ON OCT. 20. it is understood a contract totaling $2,783,745 was awarded the Great Lakes Dredge & Dock Co. by the United States engineers of the Great Lakes division, for work in connection with the Toledo harbor project. It is understood that work must start by Nov. 17 and it may be under way by Nov. 10. Bids on some additional work in connection with the same project were thrown out and it will be re-advertised.

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A LOAN of $750,000 has been allowed the Tampa Shipbuilding & Engineering Co. by the federal public works board. A 10,000-ton floating dry dock will be one of the principal additions to the company's facilities which this loan will now make possible. The dry dock will be constructed at the company's own plant. Materials are soon to be ordered and work initiated.

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NO RED tape will be allowed to slow up the actual beginning of work on the naval program in private shipyards or in navy yards for that matter. Every effort is being put forth to speed up the completion of enough plans and preliminary work to permit laying of keels. At Newport News Shipbuilding & Dry Dock Co., the keel for the first of the two new airplane carriers will be laid early in November. Material and equipment buying is already actively under way.

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THE navy department has been allotted over one-half million dollars from the public works program for the specific purpose of buying tools and handling equipment.

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ACCORDING to J. W. Powell, president of United Dry Docks Inc., his own company and the other two companies, Bath Iron Works and Federal Shipbuilding Co. each having orders in hand to build two 1500-ton destroyers, have already placed orders with allied industries for materials and equipment worth $6,000,000. Within a month additional large orders are to be placed. And this is only a comparatively small part of the entire naval program.

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GENERAL ELECTRIC CO. has received an order for propulsion machinery for six of the new twin screw destroyers which have been contracted for by the United States navy. This machinery consists of twelve sets, double reduction, geared turbines. The total cost of this machinery which will be built at the Schenectady works is approximately $2,500,000.

Submarine Torpedo Boat Holland

Historic Exhibition on the Potomac

By Capt. Frank T. Cable

GEORGE WASHINGTON sitting on the spacious veranda of Mount Vernon never dreamed of the marvelous exhibition of the possibilities of submarine warfare that was to take place upon the broad bosom of the Potomac river directly in front of Mount Vernon on March 14, 1900.

The event was the first public trial of the submarine torpedo boat HOLLAND. The exhibition was made for Admiral Dewey and his staff and in the party were many naval officers, congressmen and United States senators.

About this time the first lord of the English admiralty expressed his disbelief in the submarine. The French, however, still maintained a keen interest and were preparing to build several boats.

The exhibition which we were to give was to convince not only the United States government but the navies of the world that the claims we had made for the submarine were true.

Best Submarine of Her Day

The HOLLAND was probably the most perfect submarine boat that had been built up to this time. We had been lying at the Washington navy yard for several months overhauling the boat and putting her in the pink of condition for this exhibition.

At eight o-clock in the morning on the day set for the trial Lieut. H. H. Caldwell, aid to Admiral Dewey, reported to me on board the HOLLAND. Ten minutes later we were under way headed for our course down the river. By eleven o'clock a notable gathering had congregated at the navy yard. The President's yacht SYLPH in command of Lieutenant Hise, the Holland company's yacht JOSEPHINE, and the navy department tug TECUMSEH were at the wharf to carry the spectators to the scene of the exhibition.

On board the SYLPH were Admiral Dewey and his staff, Asistant Secretary of the Navy Allyn, Commander Kimball who commanded the torpedo boat flotilla in Cuban waters during the Spanish American war and other prominent naval officers. On board the JOSEPHINE were several congressmen and senators. The tug TECUMSEH carried representatives of the press association.

Program of Exhibition

Programs of the exhibition were distributed among the guests and were as follows:—

When the SYLPH the President's yacht blows two whistles the captain of the HOLLAND will be notified to commence the exhibition. When we were ready to fill our ballast tanks preparatory to diving we were to blow one whistle from the HOLLAND. We were then to make a submerged run of about ten minutes which would carry us a distance of approximately one mile.

The start was made one mile off the buoy at Mount Vernon. At the expiration of the mile run the HOLLAND was to come to the surface, discharge a torpedo at an imaginary enemy's war vessel and dive immediately; turning around under water and return one-eighth of a mile on the same course showing her ability to escape from an attack. Coming to the surface she would then make four or five quick porpoise-like dives to show the facility of handling her in the vertical plane. She would then discharge the water from her ballast tanks and await further directions. Three whistles from the SYLPH were to indicate that the exhibition was finished.

To avoid accidents the HOLLAND was allowed to come up for observation once or twice during the ten minute run.

When the exhibition boats arrived off Mount Vernon the little HOLLAND could be distinguished laying close to the surface of the water with her crew on deck including Lieutenant Caldwell. There was considerable manoeuvering on the part of the inspection boats, especially the SYLPH, to gain a fair view of the submarine. The crowds had their glasses on the HOLLAND as she waited to hear the signal from the SYLPH. Suddenly two whistles sounded from the SYLPH. There was an answering signal and in a few seconds the little HOLLAND had vanished, and the run down stream had commenced.

Firing a Blank Torpedo

For ten minutes the SYLPH closely followed the HOLLAND'S flags that just skimmed the surface of the water. Then quickly the boat appeared on the surface, for an instant she remained almost motionless. There was a puff of air and a blank torpedo churned the water at the HOLLAND'S bow and started on its run down stream, leaving only a line of bubbles in its wake. The spectators watched the torpedo course until it disappeared in the distance. The HOLLAND was no longer visible. She had turned completely around and was racing up stream to escape attack from a supposed enemy.

At times she would unexpectedly appear and before the spectators realized that she was again riding the waves, she would be lost to view, plowing along entirely submerged.

Admiral Dewey watched these trials from the stern of the SYLPH and apparently took great interest in the maneuvering of the little boat. On being asked as to the HOLLAND'S work the Admiral would not talk at length but remarked she had successfully carried out her program. There was not a mistake made during the entire exhibition.

The HOLLAND was 53 feet long. Its largest diameter was 10 feet, and the displacement 74 tons.

The navigating instruments were of the crudest kind. Periscopes had never been heard of. The compass was only 2½ inches in diameter and was so heavily compensated that there was very little directive force.

The Submarine of Today

The present day submarine is more than twenty-five times the size of the little HOLLAND and is equipped with very latest type of navigating instruments including gyro-compasses, several periscopes for observation while submerged and all other modern devices to make submarine navigation safe.

The latest boats are more than 300 feet long, 2000 tons displacement and have a surface speed of 18 to 20 knots.

After the exhibition of the HOLLAND was completed we returned to the Washington navy yard and Lieutenant Caldwell submitted to Admiral Dewey the following report:—

"Throughout the performance there was no accident or hitch of any sort and the ease with which either part of the mechanism of the boat was manipulated was particularly impressing.

"Each member of the crew had a special station, where he remained during the runs. Although these men were all highly skilled and showed a confidence due to their long service in the boat, I think the duties could easily be performed by the petty officers of the navy after a short trial. The boat did not roll and she only pitched slightly at the time of diving, but righted immediately after attaining the required depth. The torpedo was discharged with the greatest ease.

(*Continued on Page* 40)

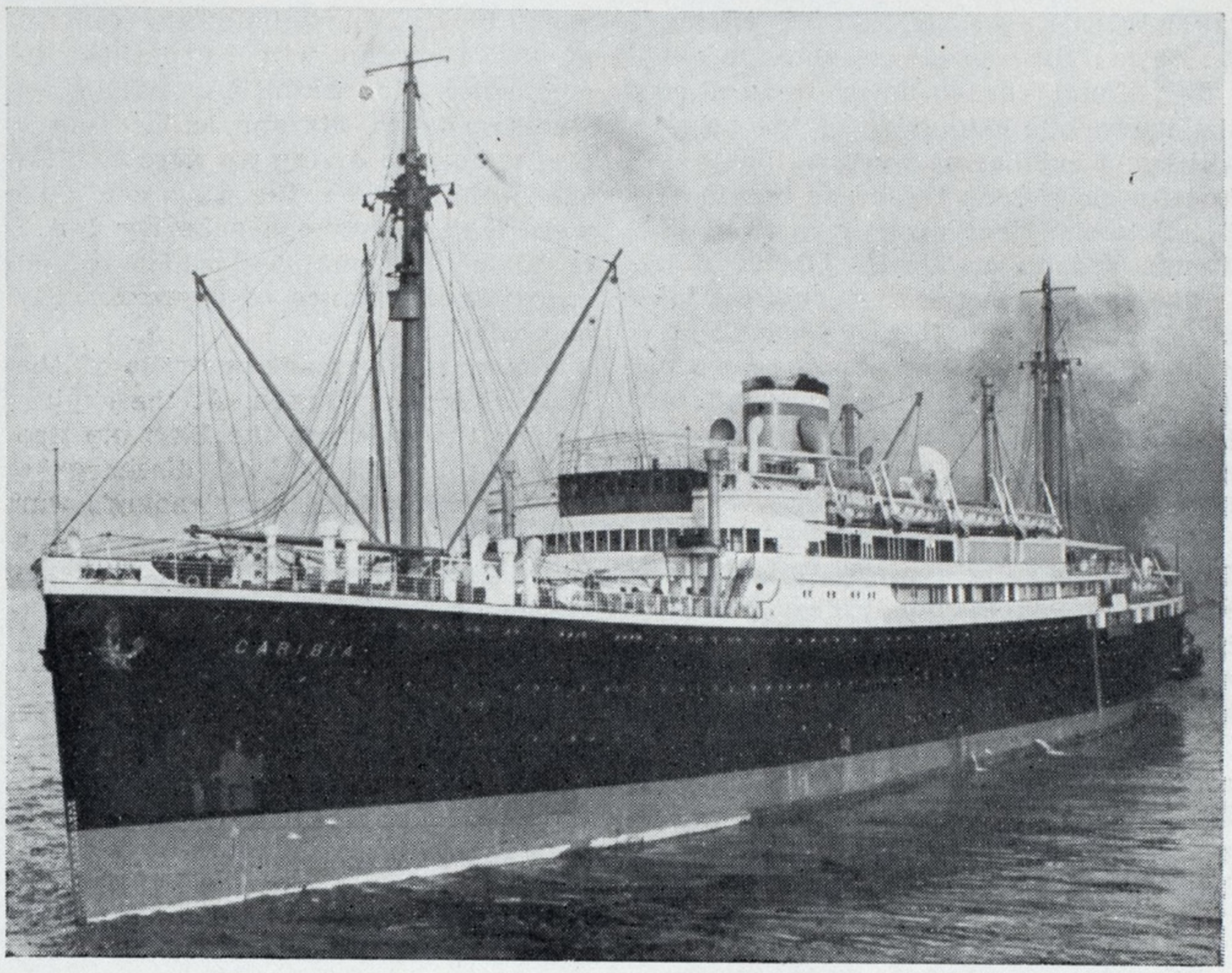
THE EUROPEAN DIESEL,

In Competition with Steam Drive

BY F. C. BOWEN

NOTWITHSTANDING lack of orders and the generally low condition of shipbuilding, many new ideas have been advanced in the marine field during the past year or so, particularly in connection with the design, construction and use of the internal combustion engine. Careful examination reveals two curiously contradictory factors.

On the one hand it has been found practical to employ the diesel engine for types of vessels both in the larger and smaller sizes which heretofore had been considered outside of the range of its usefulness even by the most ardent enthusiasts. On the other hand in this same period marine steam engineering has made such rapid progress in overcoming its previously acknowledged disadvantages that steam machinery for propulsion has been applied in types of vessels and services formerly regarded as particularly suited to the use of diesel machinery. This seems to be especially true of the fast cargo ship. As a result of these improvements, steam has again found favor with flags and firms formerly associated almost entirely with the internal combustion type of machinery.



Hamburg-American Line Passenger and Freight Twin Screw Motorship Caribia—11,000 B. H. P.—Speed, 17 Knots—Germany-West Indies Service

Place for Steam and Diesel

Consequently the old tendency to regard one system or the other as the only ideal solution is now obsolete and seldom heard except from a handful of diehards. It is now generally admitted that both systems have advantages and disadvantages depending much on the trade in which the ship is engaged and the kind of fuel readily available. By which is meant the suitability of the fuel for the two types of power and the existence or lack of a substantial differential in cost between the grades used for the one and the other. It may, therefore, be said that the interchange of advantage which has come to be recognized as existing in the case of diesel and steam will in the immediate future bring about even keener competition between the two. The resumption of better class shipbuilding on any considerable scale is sure to bring about even more radical developments than those with which we have become familiar.

Reduction of dimensions, weight and first cost, still greater reliability under difficult conditions of service, and the possibility of digesting any fuel that may be obtainable in the course of a voyage are the great problems which continue to receive the attention of the diesel engineer. The steam engineer, of course, is always attempting to bring his fuel consumption down to that of the efficient diesel, for it is on fuel consumption that the newer engine has made its reputation.

Many Different Makes

The makes of diesel engine now on the market are many, each maker having his own particular ideas, his own individual patterns, and in most cases his own publicity department to push forward his claims to favor. Small wonder that the shipowner intending to order a motorship is liable to get confused, and small wonder that some fleets contain so many different engines that the task of keeping them in stores and spare parts is a heartbreaking one.

But the bigger shipowners at least, who are not so influenced by the terms that can be offered by a company anxious to attract attention, are showing a greater tendency to stick to one type in order to have their spare parts interchangeable and to be able to train their engineer personnel to a high pitch of perfection. This policy is assisted by the licenses that have been granted to companies all over the world to build the better known types, notably the Burmeister & Wain, Sulzer and M A N. Even so, there is far greater multiplicity of design than is to be expected with steam, and although, of course, it is important that no curb shall be put on experiment with the idea of development, the next few years will undoubtedly see far more simplification and standardization in diesel engineering.

In the meantime there is greater need than ever to rectify the essential faults of the diesel in relation to steam. Only a few years ago the weight and space of a large diesel installation was of comparatively minor importance compared with economy, but the development of high-pressure steam has made it imperative that these factors be carefully considered. At the same time it must be remembered that recent improvements in steam plants have added to their complication and, more important still, to their cost. While modernizing steam machinery has increased its cost the diesel engineers have met with considerable success in reducing capital cost. Some of the best diesel engine builders are now contriving to

approximate the price of a first-class steam set, but as yet that is only possible in the larger powers.

Reduction in Weight and Cost

This reduction in capital cost, which will in time apply to all powers, is partly due to the growing tendency to standardize a large number of accessories and parts which were formerly made in small numbers by the diesel builders themselves. There are now a number of specialist manufacturers who deal with these parts only and who are able consequently to turn them out at a much lower cost. Rotary blowers, fuel pumps, valves, piston rings, packings etc. are only a few of the items that may be mentioned in this connection and the tendency is steadily increasing.

One means by which weight can be saved in any type of engine, and a means which is being brought more and more into use, is the use of electric welding in diesel construction. This has been made the subject of careful investigation by Sulzers and other diesel firms and they have proved beyond doubt that it is quite practical and meets all the claims made. At the same time it is recognized that welding must be used with the greatest care if trouble is to be avoided. That, however, is a remark that may be applied to practically every process which has to do with a diesel engine.

More Power per Cylinder

Another and obvious means of saving weight is increasing the power per cylinder, and this has been successfully done with perfect safety by most makers. At the same time it has the disadvantage of complicating various problems, particularly the cooling of two-stroke and double-acting types, but this problem also is being overcome very largely by the use of the telescopic pipe system and nickel copper alloy. Weight has also been saved by increasing the piston speed, and speeds are now commonplace which would have been regarded as quite impossible for use at sea only a few years ago. Most authorities, indeed, believe that high speed diesels will be used more and more. In the auxiliary engine room that was to be expected, but objections to higher speeds for the main propelling engines also are gradually disappearing.

It will be remembered that shortly after the war the Hamburg American line, anxious to put fast cargo ships on service as quickly as possible, but finding themselves liable to be held up by slow delivery of marine engines, tried the daring experiment of fitting fast-running submarine diesels into cargo ships, gearing them down to an efficient propeller speed. This practice is now gaining favor without the compulsion of circumstances, and quite a number of modern ships have geared diesels, either for the purpose of reducing the propeller speed, or often combined with that, of having two or more diesels of a workable size geared to the same shaft. The hydraulic clutch has been found to be an efficient and satisfactory means of gearing in this way, and the practice is growing. One of the advantages in this type of drive is the conspicuous reduction in vibration.

Transmitting Higher Powers

It is only by some form of transmission (gearing or electric) that the diesel engine can satisfactorily deliver the enormous power per shaft which is now demanded. The highest so far installed is 27,000 horsepower on each shaft in the case of the German battleship DEUTSCHLAND.

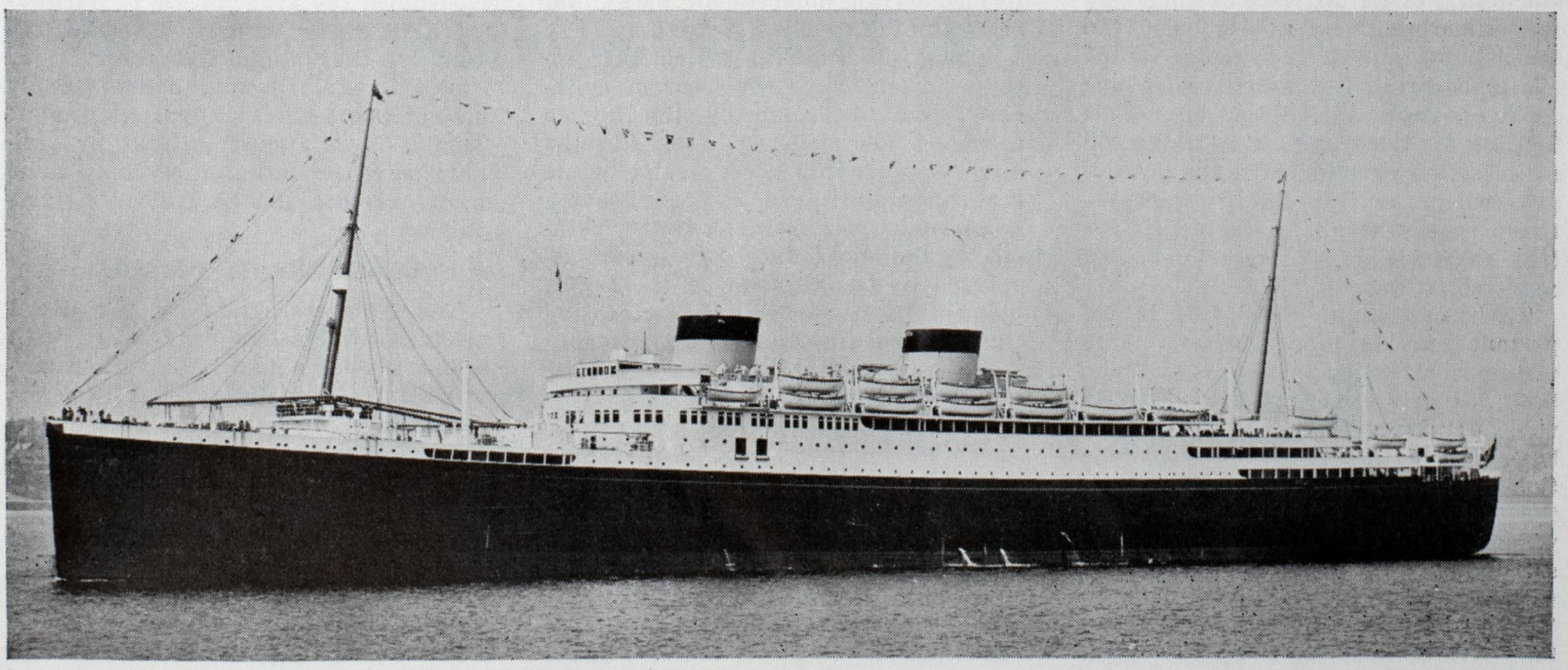
Another symptom of the ever-present desire to reduce the weight of the diesel is shown by the steadily increasing proportion of the two-stroke cycle engines in comparison with the four-stroke. According to the last report, something like 60 per cent of the number of installations ordered or under construction in Europe are on the two-stroke cycle principle—far more if the reckoning is made in horsepower—and this proportion shows a tendency to increase still further. In 1929, by way of comparison, the percentage installed was only 37.

But even when the two-stroke cycle is selected, there is still the question of single acting versus double acting, a question that is only an echo of the same argument with steam in its early days. The double acting principle has made enormous strides recently, but the single acting type still has many advocates, and a good many converts, on account of its simple construction. The problem would appear to be very largely one of labor and, like so many other problems connected with the diesel engine, will resolve itself according to the trade on which the ship is to be used and the type of labor that can be obtained.

Double Acting Engine Established

On the other hand, there is no doubt that the two-stroke cycle double acting type is now firmly established, and such an eminent authority as M. Sulzer believes in the possibilities of a new light-weight two-stroke cycle double acting engine for concentrating high cylinder power on a short length. The steady development of the type has reduced the necessity for a large number of cylinders per engine in big ships and greatly simplifies their manufacture by firms that were accustomed to reciprocating steam jobs, another influence in reducing the first cost.

A considerable number of engines are now being built on this principle. The opposed piston two-stroke cycle airless injection engine may be described as an offshoot; it has been severely criticised on theo-



Largest British Motorship—Liner Georgic—27,759 Gross Tons—Horsepower 20,000—Speed 18 Knots—Twin Screws

retical grounds, but has proved extraordinarily satisfactory in service. On more orthodox lines, among other firms may be mentioned Richardson Westgarth & Co., who is turning out a double acting two-stroke cycle airless injection engine developing 1200 brake horsepower per cylinder at 115 revolutions per minute for which is claimed cheaper construction than any other diesel engine coupled with exceptionally low weight.

But the four-stroke cycle engine is not dead by any means, and for the smaller powers it is still finding greater favor among those who have had long experience of their diesels. For the higher powers it has been said that it has only been saved from extinction by pressure-charging and it has to be admitted that the recent improvements in this method have greatly reduced the total weight of four-stroke cycle machinery as compared with two-stroke.

Success of Supercharging

Supercharging has amply fulfilled its original claims to notice. The Blue Funnel line, which uses diesels extensively in long-distance ships, has published definite figures showing the success of the up-to-date supercharger; average speed increased from 12.89 knots to 13.21, with the consumption of oil per indicated horsepower per hour only increased from 0.310 to 0.316 pound. In pressure-chargers, however, there is the same difficulty of multiplicity of types and greater standardization will be a godsend to the shipowner.

From the struggle between four-stroke and two-stroke engines it is only a step between the airless injection and the older-fashioned compressor engine, the latter seeming likely soon to disappear altogether. The airless injection system simplifies manufacture as the compressor is costly and troublesome to make because of the machining of its intricate castings and its numerous small parts. On the other hand, and it is a factor which has to be given full weight when one considers how the diesel engine is fighting for the tramping field, the old air injection principle still has advantages when the ship has to trade between ports where it is likely that the fuel available is of widely varying characteristics.

This question of diesel fuel is important and, is now receiving more and more attention by the experts who have hitherto been a little prone to neglect it. Many modern diesel engines have proved that their fuel consumption in service is as low as it was on the test beds, a thing that cannot always be said of the steamer, but this satisfactory result is not obtained without greatest care, and this care is more than ever necessary. Interesting investigations have recently taken place in this connection, for there is no doubt that choked fuel valve pulverisers and dirty inlet valves have been the all too frequent results of using the wrong oil. The matter of standardizing different grades of diesel oil all over the world is a pressing one, but at the same time it is not by any means easy. Mention must be made of the interesting experiments in Holland in order to determine how much cylinder wear is influenced by the fuel and lubricating oil used.

Is Special Fuel Necessary

Experiments and experience have shown that, provided the necessary precautions are taken, it is not by any means diiffcult to run a diesel engine quite satisfactorily on boiler fuel, but the precautions are absolutely essential. To do so has long been the ideal of the motorship owner, anxious to run his ship at the lowest possible fuel cost; but it has been the cause of infinite trouble apparently due mostly to incorrect adjustment of the fuel valves and the wrong lubricating oil. Careful preheating and filtering is most necessary. In Britain experiments have been carried out to ascertain whether diesels will run on oil distilled from coal—if successful it will mean a huge difference to the British coasting motorship—while the Germans are trying to revive Dr. Diesel's original dream of running his engine on pulverized coal fuel instead of oil.

Engineers and scientists have also been putting in some magnificent work overcoming the inherent disadvantages of the internal combustion engine. Steady improvements have been effected which tend to overcome the old problem of scavenging in two-cycle engines, with their increasing popularity. Many inventions have been put on the market and have been examined with the greatest care, for bad scavenging is one of the greatest handicaps of this type and is admittedly a difficult problem to overcome. The general and growing opinion is that successful scavenging is best performed by an independent blower on account of its easier regulation.

Among other points which have received attention is the wear of cylinder liners, increased by the higher speed of the modern diesel. Chrome alloy is producing good results, while the vulnerability of cylinder covers has been reduced, among other methods, by the new building-up process developed by the German A. E. G. Co., using forged steel. Covers made by this method are stronger and roughly 8 per cent lighter than the orthodox cast iron cover.

Steamers Converted to Diesel

With these various improvements affected it is not surprising that a number of the cargo liner companies, notably the Nederland line and the Rotterdam Lloyd, are converting a number of their slower steamers to diesel power in order to obtain a speed able to compete with the newest ships of this type. In some cases twin high-speed engines have been geared to a single shaft. In others, improvement in the engine room has been supplemented by hull improvements, notably the fitting of new bows on the Maier principle to reduce resistance. As an example, without hull alterations, the former Royal Mail Steam Packet steamer MONTGOMERYSHIRE was converted to diesel power by her Italian purchasers, adding a knot and a half to her average speed and reducing her oil fuel consumption by 66 per cent.

The other side of the picture is that the Royal Mail Steam Packet Co., wishing to speed-up their pioneer motorships ALCANTARA and ASTURIAS in order to compete with French, German and Italian rivals, has decided to take out the diesel engines and replace them with high pressure geared turbines. A similar conversion is also rumored to be under consideration for one of the earlier big Italian motorships whose speed is now inadequate for her service.

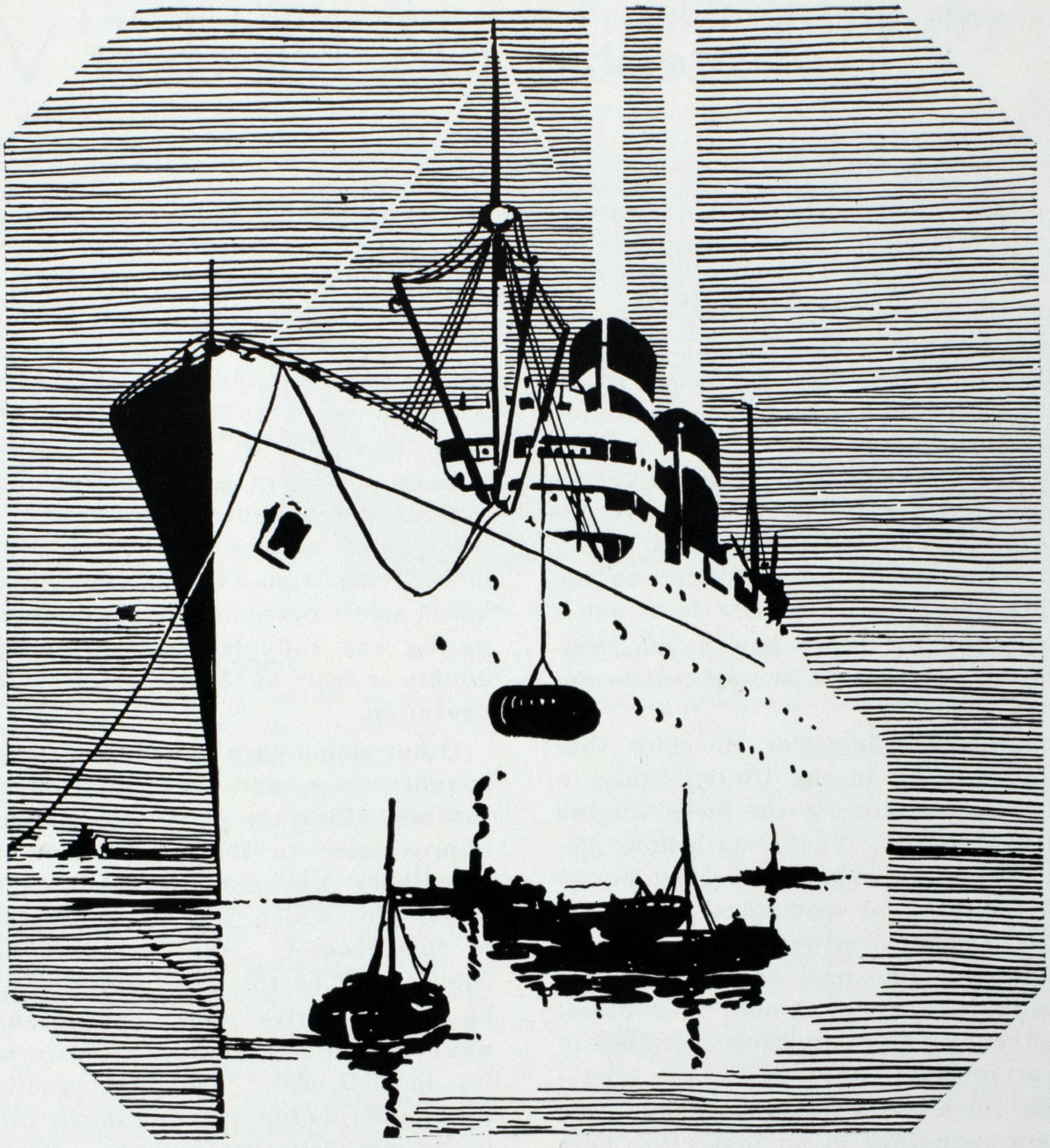
Great progress has also been made in the auxiliary engines of motorships, a consideration which the shipowner and the marine engineer always have to keep in view. The most conspicuous advance, perhaps, has been made in the use of exhaust heat boilers which generate enough steam from the waste heat which normally goes up the funnel to work all the auxiliary machinery at sea. The same boilers burning oil are used in port when the main engines are not running. It is seldom now that a modern motorship is built without this eminently practical and economical fitting, the latest types being given feed heaters and superheaters. The biggest exhaust heat boiler equipment afloat is in the White Star Liner GEORGIC, one of the most successful pasesnger carriers on the Western ocean. It is sufficient to drive the supercharger blower and all the auxiliary machinery demanded by a high class passenger ship.

In the auxiliary field may also be mentioned the growing use of horizontal diesels for various purposes, the fear that they would wear the cylinder liners irregularly and cause trouble having proved unfounded. At present they are used almost entirely for auxiliary purposes but the day may come when they can also be utilized for propulsion.

Diesel Electric Propulsion

The progress made by the diesel electric system in connection with sizeable vessels has been rather surprisingly disappointing, but this has been most probably due to the few shipbuilding orders placed during the period under review. Fruiters and tankers have done quite well with the system but it has not spread to other types as might have been expected. On the other hand, in the smaller division, the application of diesel electric power to the tugs AKLAM CROSS and

(*Continued on Page* 40)



Marine Diesel Engine

Section

November 1933, Issue

Marine Review

New York London Cleveland

THE AMERICAN DIESEL,

Its Acceptance for Merchant Vessels

BY A. H. JANSSON

THIS is the eighth consecutive year, in the November issue of MARINE REVIEW, in which an attempt has been made to establish the current position of the diesel engine as power in American merchant craft. A direct approach to a practical answer to this question would seem to be to review the outstanding diesel installations made by the various engine builders. As in former years, therefore, a number of marine installations are described and illustrated in the following pages. Since shipbuilding like all other industries has been at a low ebb during the past year, not a single installation of diesel power has been made in the larger sizes or in any real ocean going craft.

These installations, however, do show that there continues to be in the United States a broad field of application for the diesel engine in a variety of craft. The installations described include: twin engines of 1000 horsepower each for fast and economical freighters converted from naval destroyers; a 600 horsepower engine in a fine new harbor tug; two 1360 brake horsepower engines in a diesel electric dredge; two 590 horsepower engines in a large river towboat; one 1200 brake horsepower engine for a dredg pump drive; and two 300 horsepower engines in an inspection boat for river work.

It is hardly necessary to do more than call attention to these recent practical installations to show that the marine diesel engine is finding widespread acceptance in many types of merchant craft which are an essential and important part of the floating equipment required in the extensive activities of the United States on the water in coastwise, harbor, river, and inland waterways.

In the larger powers and for ocean going vessels, one answer to the complete nonexistence of recent applications is the fact that only two vessels of this type have been ordered during the past year. This is not, however, the whole story. It must be admitted that the shipowners of the United States have not shown the same partiality for diesel power in larger ocean going vessels that the European owners have. By and large the American owner is not thoroughly convinced, everything considered, that he will be better off with diesel than with steam power. This is no doubt partly due to the confusion that exists in his mind and also in the mind of his engineering adviser when it comes to the selection of a specific make of engine to meet his requirements. It will be necessary for American diesel engine builders to completely overcome this attitude, if the selection of a diesel engine in the larger powers, say from 2000 horsepower up, is to be based solely on economic considerations, eliminating any influence on the decision due to doubts or fears as to successful and dependable operation.

Other elements which enter in are: first cost, weight, space, and the great improvement in thermal efficiency of steam machinery. This improvement in thermal efficiency of steam machinery has not overtaken a substantial advantage which the diesel engine still has in this respect. Here again the question is complicated by the great difference in the cost of the respective fuels, so that the owner is unable, in many trades, to figure on any saving in fuel cost. The most practical way to overcome this big question in the owner's mind is by authoritative actual performance cost figures of vessels now in operation in various trades. This matter cannot be side stepped by the proponent of the diesel engine; it must be squarely met by facts.

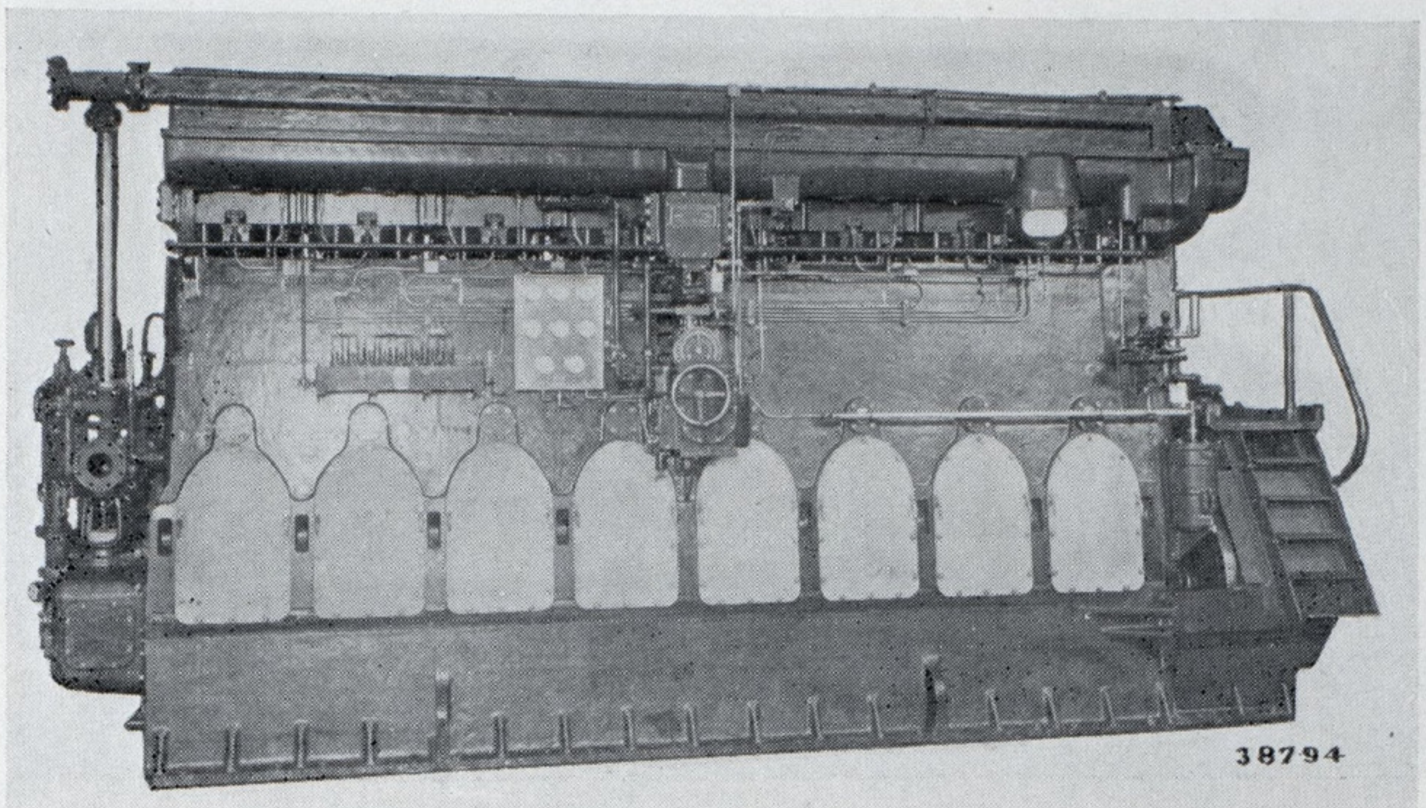
An article elsewhere in this issue, on the status of the diesel engine abroad, clearly indicates the wide divergence between the American and European operator in their attitude concerning diesel power. Lloyd's reports show the great development which has taken place in the use of internal combustion engine in the world's merchant marine. As of June 30, 1933, there were 1501 steamers of 11,022,000 tons fitted with turbines or combination of steam turbine and reciprocating engines, and there were 4663 vessels including auxiliary vessels of 10,200,000 tons fitted with internal combustion engines, as compared with 730,000 tons and 220,000 respectively in 1914.

Diesel Direct Drive in Freighter Matagalpa

Two Engines—Each 1000 B.H.P.

DESCRIPTION

Two engines of this type are each direct connected to a propeller. The engines are of trunk piston type with overhead cam shaft, enclosed, box cylinder casting, individual liners, shell bearings, fuel pump and distributor. Opposed spraying nozzles are fitted. The engines are of eight cylinders, four-cycle, single acting and solid injection.



Engine

Name of Engine—Ingersoll-Rand; **Year**—1932
Builder—Ingersoll-Rand Co.; **Cycle**—4
No. of Cylinders—8; **B.H.P.**—1000
Action—Single acting; **Injection**—Solid direct
Bore—16 in.; **Stroke**—24 inches; **R.P.M.**—270
Piston Speed—1080 feet per minute
Pressure Brake—75 lbs.; **B.H.P. per Cyl.**—125
Mech. Eff.—83%; **Wkg. Strokes per Rev.**—4
Length—25′ 8″; **Height**—11′ 7″; **Width**—4′ 11″
Weight—115,000 lbs.; **Reversing**—Direct
Weight—Pounds per brake horsepower—115
Air Compressor—Motor driven, for starting only.

Vessel

Name—MATAGALPA; also sister vessel, MASAYA
Type—Destroyer converted to fruit freighter
Owner—Standard Fruit and Steamship Co.
Builder—Converted by Todd Shipyards Corp.
Completed—Fall of 1932
Main Drive—Twin Screw, diesel direct
Length B. P.—310 feet; **Beam**—30 ft. 11.5 in.
Depth—20 ft. 7¾ in.; **Draft**—10 feet, 3¼ in.
Speed—16 knots; **Number of propellers**—Two
Radius Without Refueling—12,000 miles
Generator—Westinghouse, 35 k.w. @ 450 r.p.m. driven by Ingersoll-Rand diesel engine

Remarks

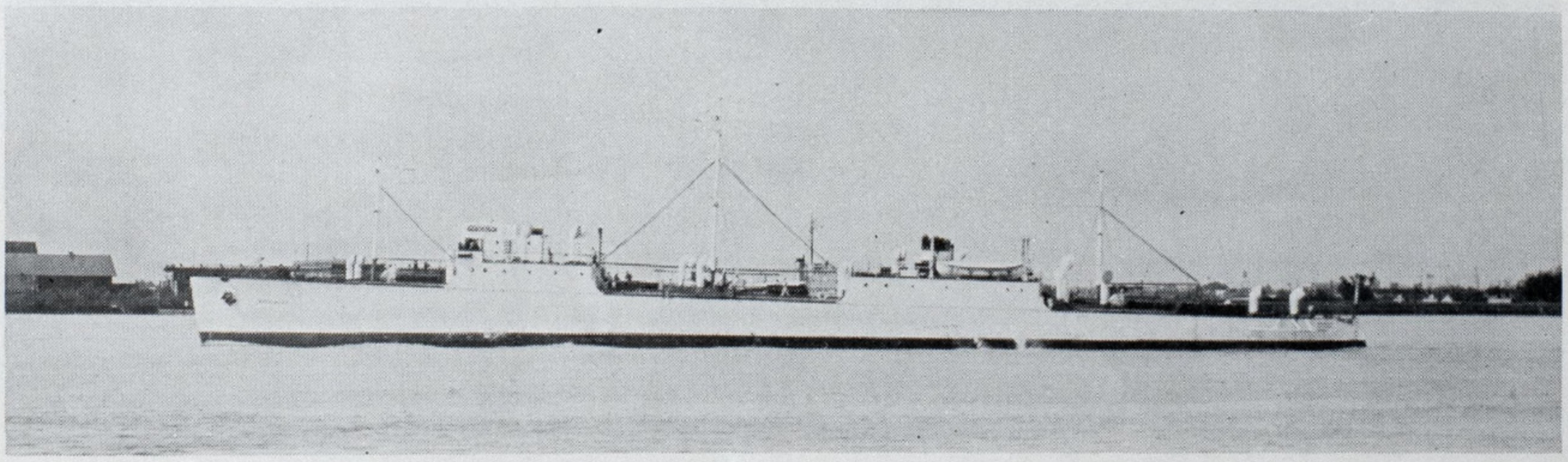
The successful operation of the TEAPA and TABASCO, twin screw diesel 15-knot express fruit carriers, converted from two United States destroyers in 1931 for the Standard Fruit and Steamship Co., New Orleans, has resulted in a similar conversion of two additional destroyers.

The two latest vessels, the MATAGALPA and the MASAYA, have had similar engines installed but of eight cylinders instead of six, giving them an additional 500 brake horsepower each and an increased sea speed to 16 knots.

As reconditioned the vessels have been divided into four cargo holds each served by one hatch and having a total carrying capacity of 25,000 stems of bananas per vessel.

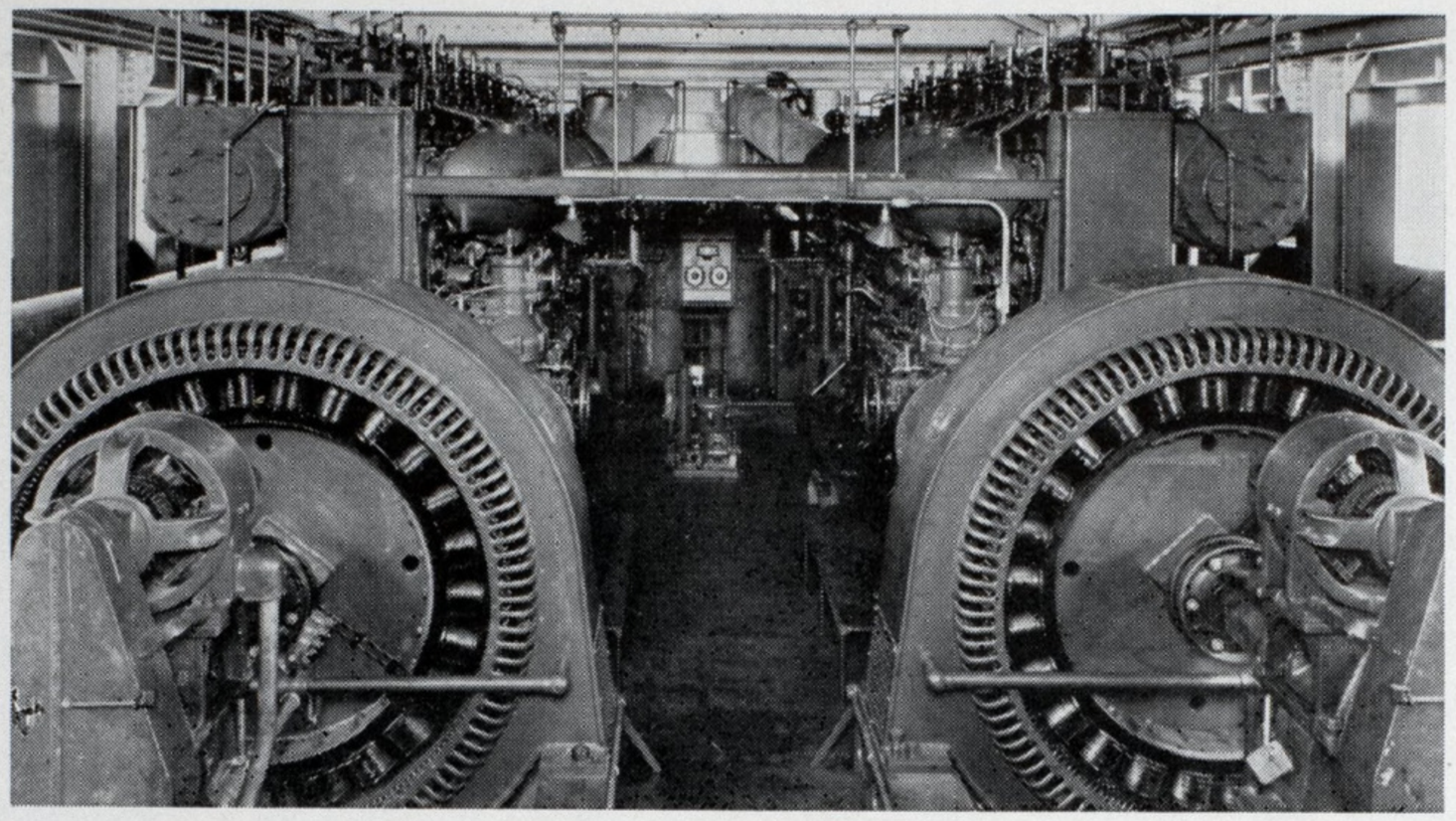
Electric welding was used throughout for the superstructures and main engine and auxiliary foundations.

The vessels are registered under the American flag and are in service from the Central American countries to New Orleans, Galveston, Baltimore, Philadelphia, New York and Boston.



Diesel Electric Drive in Dredge Duplex

Two Engines—Each 1360 B.H.P.



DESCRIPTION

Two trunk piston airless injection diesel engines of the type described below are each direct connected to a 1000 kilowatts generator with exciter driven by silent chain drive. Each unit is mounted on a cast iron base forming lubricating oil sump tank. In these engines a separate piston housing provides full length bearing for the pin.

Engine

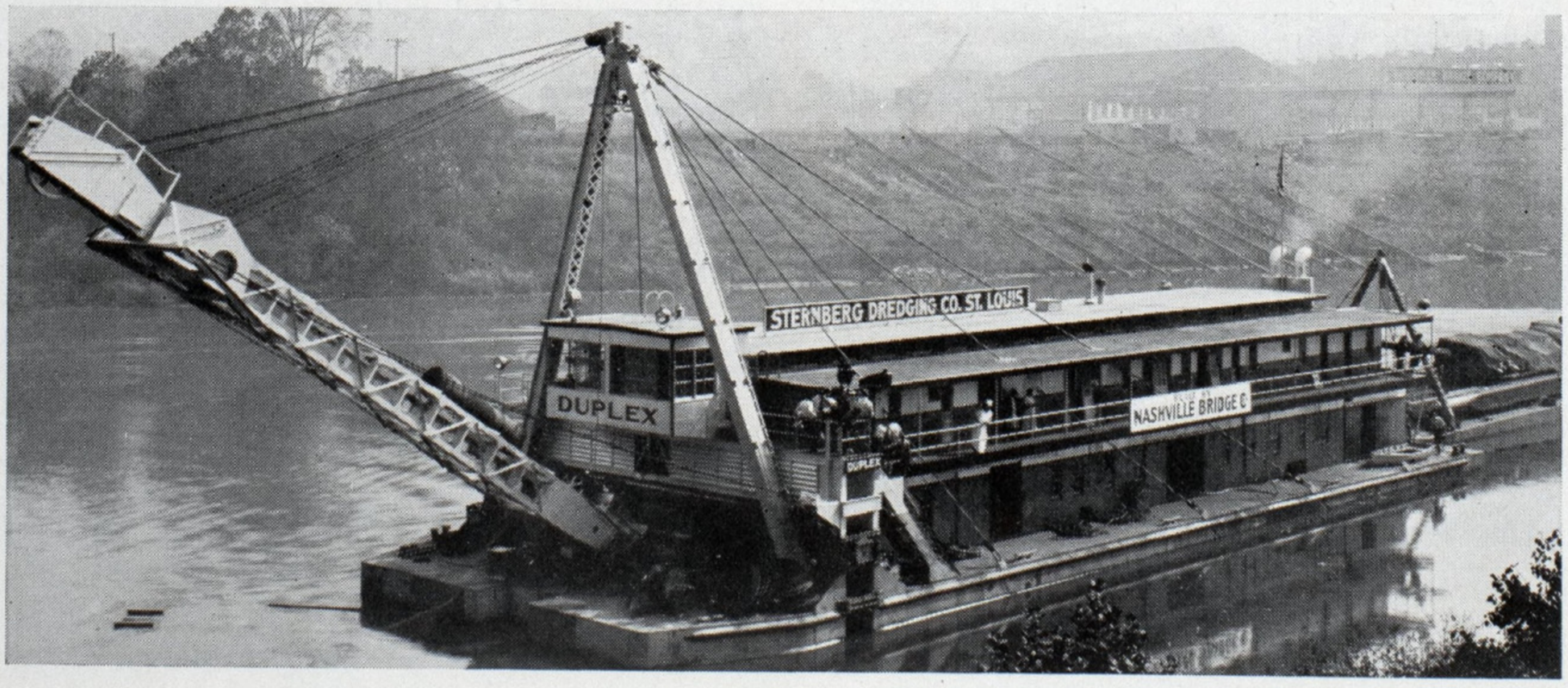
Name of Engine—Busch-Sulzer; **Year**—1931
Builder—Busch-Sulzer Bros., Diesel Engine Co.
Cycle—2; **No. of Cylinders**—8; **B.H.P.**—1360
Action—Single; **Injection**—Mechanical (Solid)
Piston Coolg.—Oil; **Scaveng.**—Motor drive blower
Bore—15⅛ in.; **Stroke**—21.; **R.P.M.**—300
Piston Speed—1050 feet per minute
Pressure Brake—59.5 lbs. per square inch
B.H.P. per Cyl.—170; **Stroke to Bore**—1.388
Working Strokes per Revolution—8
Length O.A.—28 feet 5 13/16 inches, complete unit from engine lubricating oil pump to exciter chain drive housing
Height O.A.—12 ft. 4¼ in. complete unit from bottom of sub-base to top of valve.
Width—9 ft. 5¼ in. complete unit at generator
Weight—Engine, gen. & sub-base—165,500 lbs.
Weight—per b.h.p. including generator—121 lbs.
Reversing—Non-reversing
Air Compressor—Motor driven, for starting air

Vessel

Name—Duplex; **Type**—Self-propelled dredge
Owner—Sternberg Dredging Co.
Builder—Nashville Bridge Co., Nashville, Tenn.
Completed—September, 1931
Drive—Twin screw diesel electric
Length—150 feet; **Beam**—50 feet
Depth—7 feet, 10 inches; **Draft**—5 feet, 6 in.
Propellers—Two; **Fuel Capacity**—666 bbls.
Fuel Consumption— Lb. per b.h.p. per hr.—0.39
Generators—Two, General Electric, 1000 k.w. at 300 r.p.m., two-cycle diesel drive

Remarks

From an engineering viewpoint and the large power in her machinery the dredge Duplex is an unusual craft. This vessel, a combination suction cutter and clam shell dredge, was designed by H. J. Sternberg, president of the owning company and a widely known dredging engineer. The vessel is of steel construction throughout and receives its name because of its two-fold operation.

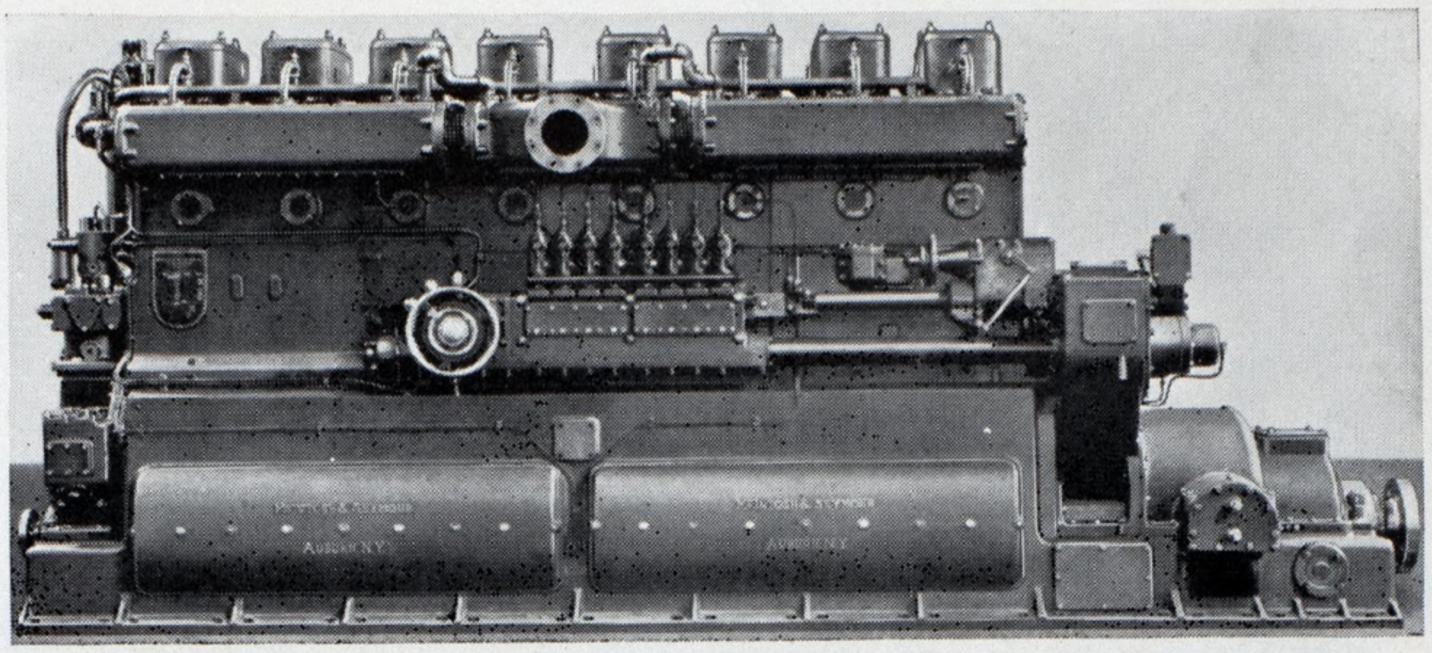


Diesel Direct in Towboat Franklin D. Roosevelt

Two Engines—Each 590 B.H.P.

DESCRIPTION

Two diesel engines of the type illustrated and described, each of 590 brake horsepower, direct connected to a propeller serve as the main propelling machinery for this vessel. Total maximum horsepower for both engines at 330 revolutions per minute is 1350.



Engine

Name—McIntosh & Seymour; **Year**—1933
Builder—McIntosh & Seymour Corp.; **Cycle**—4
Cyls.—8; **B.H.P.**—590; **Action**—Single
I.H.P.—710; **Injection**—Mechanical (Solid)
Piston Cooling—Air; **Bore**—12½ inches
Stroke—22 in.; **R.P.M.**—300; **Speed**—1100 f.p.m.
B.H.P. Per Cyl.—74; **I.H.P. Per Cyl.**—89
Mech. Eff.—83%; **Wkg. Strokes per Rev.**—4
Length—21′ 3¾″; **Height**—9′ 1″; **Width**—4′ 4″
Weight—1 engine, 58,000 lbs; **Revers.**—Direct
Air Compressor—Attached, for starting air

Vessel

Name—Franklin D. Roosevelt; River Towboat
Owner—Inland Waterways Corp.
Builder—Midland Barge Co., Midland, Pa.
Completed—July 15, 1933
Main Drive—Diesel direct, twin screw, tunnel
Length B.P.—160 ft.; **Beam**—40 ft.; **Depth**—8 ft.
Draft—4 ft. 6 in.; **No. of Propellers**—2
Fuel Capacity—50 tons, diesel fuel oil
Fuel Consumption—Lb. per b.h.p. per hr.—0.40
Radius Without Refueling—10 days

Remarks

The Franklin D. Roosevelt is an exact duplicate of the river towboat Tom Sawyer, also built by the Midland Barge Co. The latter was completed last May. Both vessels are now in the service of the Inland Waterways Corp. on the upper Mississippi river and its tributaries. They were designed by the engineering department of the Inland Waterways Corp. under the direction of Major General T. Q. Ashburn.

The hull is of steel construction throughout. Six transverse bulkheads divide the vessel into compartments. A watertight centerline bulkhead extends from the forward end to the after end except in way of the sunken deck of the engine room which has a watertight keelson.

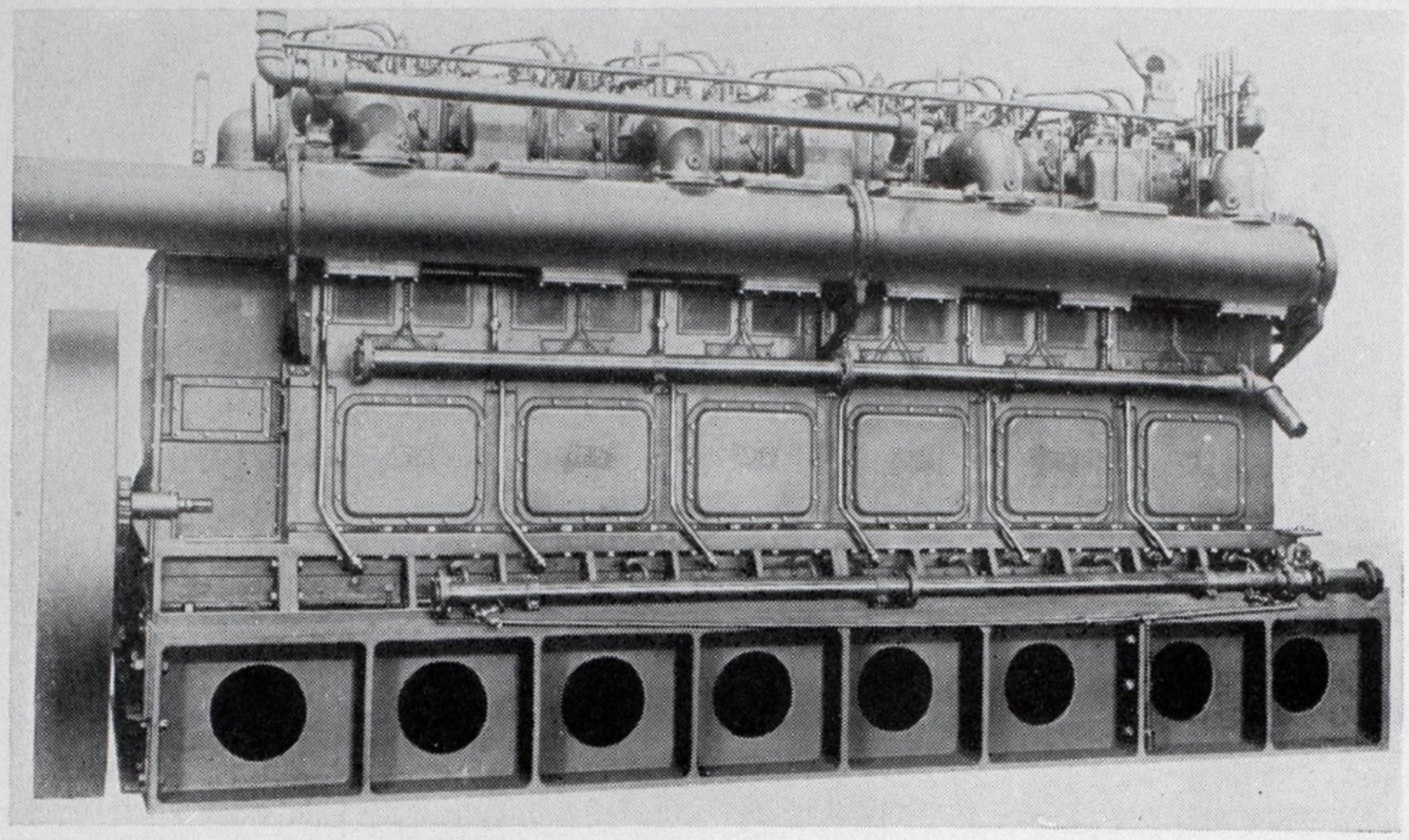
Each of the main engines is direct connected, through a Kingsbury thrust bearing, to an inboard turning propeller. The propellers are 5 feet, 9 inches in diameter and have four Dyson fan type blades. The total projected area ratio is 0.68 and each propeller is designed to absorb 500 brake horsepower at 300 revolutions per minute.

Developing this power the speed of the vessel is 8 statute miles per hour.

This is the Tom Sawyer, sistership of the Franklin D. Roosevelt

Diesel Pump Drive in Dredge Geo. A. McWilliams

One Engine—1200 B.H.P.



Engine

Name of Engine—Nelseco; **Year**—1933
Builder—Electric Boat Co., N.L.S. & E. Works
Cycle—4; **No. of Cylinders**—6; **I.H.P.**—1500
B.H.P.—1200; **Action**—Single; **Injection**—Solid
Piston Coolg.—Oil, through swinging linkages
Bore—20⅞ in.; **Stroke**—20⅞ in.; **R.P.M.**—300
Piston Speed—1044 feet per minute
Pressure Indicated—91.8; **Pressure Brake**—73.6
B.H.P.—per Cyl.—200; **I.H.P.—per Cyl.**—250
Mechanical Eff.—80%; **Stroke to Bore**—Unity
Working Strokes per Revolution—Three
Length O.A.—22 ft. 4 in.; Width—5 ft. 9 in.
Height O.A.—8 ft. 6 in.; above c.l. of shaft.
Weight—One engine, 132,300 pounds
Weight per B.H.P.—110 lbs.; **Per i.h.p.**—88.2 lbs.
Reversing—Non-revers.; **Air Compressor**—None

Vessel

Name—Geo. A. McWilliams; Hydraulic dredge
Owner—McWilliams Dredging Co., Chicago
Builder—Nashville Bridge Co., Nashville, Tenn.
Completed—In 1933
Drive—Suction dredge pump, direct connected to engine by Vulcan hydraulic coupling

DESCRIPTION

This engine drives a powerful suction pump. Since entering service the engine has given excellent performance in practically continuous duty. The oil cooled pistons are made in two parts, a steel head through whose labyrinth passages the cooling oil flows, and an iron skirt. Swinging linkages carry the cooling fluid to the pistons.

Length B. P.—140 feet; **Beam**—36 feet
Depth—9 feet; **Draft**—6 feet 6 inches
No. of Propellers—None, not self-propelled
Fuel Consumption—Lb. per b.h.p. per hr.—0.42
Generator—One, Crocker-Wheeler, 375 k.w. at 250 r.p.m., 500 h.p. diesel drive

Remarks

This new dredge is perhaps the largest in the country employing direct diesel drive. Where the discharge is through a short pipe line a 24-inch pump is used; for high discharge heads it can be replaced by a 20-inch unit.

In addition to the main pumping engine the dredge has a Nelseco six-cylinder diesel engine driving a 375-kilowatt direct current generator. This set supplies power for the cutter motor and all other purposes aboard ship.

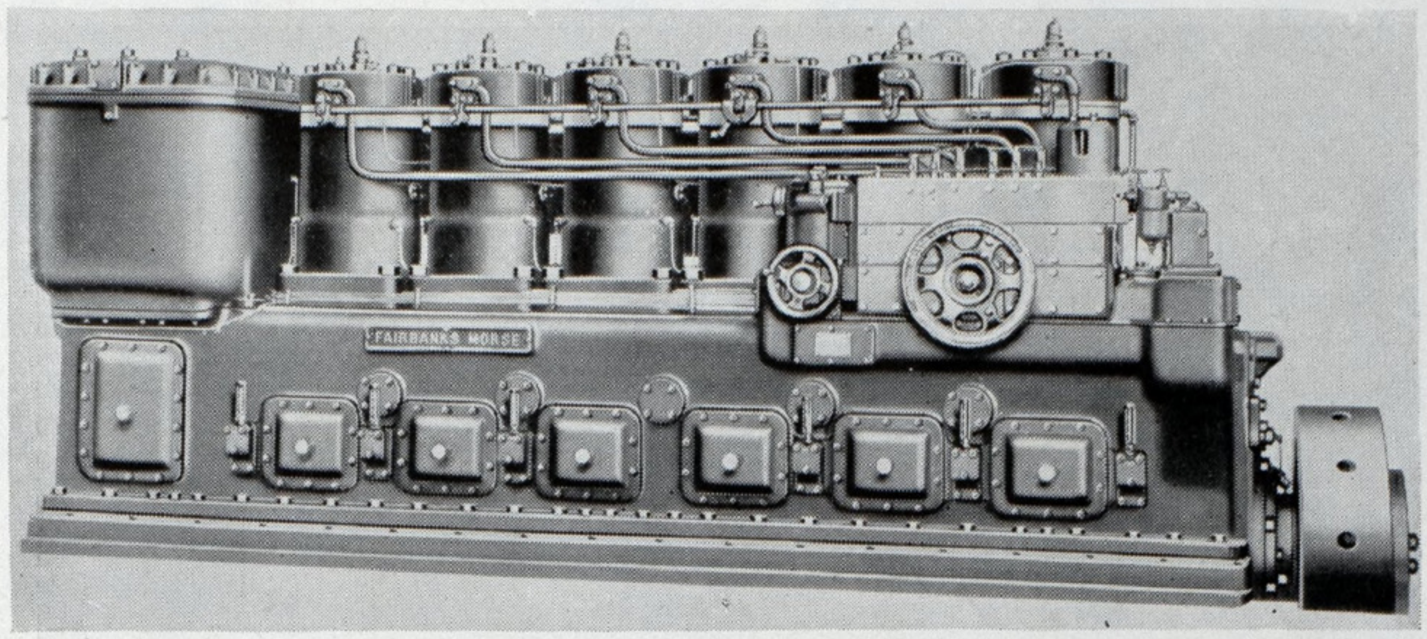
For deep digging a 70-foot ladder is used. The cutter is driven by a 350 horsepower continuous duty, 500 r.p.m. motor through reduction gears, the speed of the cutter shaft itself being 25 r.p.m. The generator engines exhausts through a Nelseco-Clarkson thimble tube boiler providing hot water for galley and washing purposes.

Diesel Direct Drive in River Boat Sergeant Floyd

Two Engines—Each 300 B.H.P.

DESCRIPTION

Two diesel engines as described are each direct connected to a screw propeller operating in a tunnel because of shallow draft. In order to obtain minimum weight certain parts of the engine are made of aluminum. This vessel is an inspection boat for river work.



Engine

Name of Engine—Fairbanks-Morse; **Year**—1932
Builder—Fairbanks, Morse & Co.; **Cycle**—Two
No. of Cyls.—6; **B.H.P.**—300; **Action**—Single
Injection—Solid; **Scavenging**—Pump
Piston Coolg.—Oil; **Bore**—10½"; **Stroke**—12½"
R.P.M.—360; **Piston Speed**—750 feet per minute
B.H.P. per Cyl.—50; **Stroke to Bore**—1.19
Working Strokes per Revolution—Six
Length O.A.—16 ft. 8 in.; **Width**—6 ft. 1⅝ in.
Height—5 feet 9¾ inches above c.l. of shaft
Weight—One engine, 30,000 pounds
Weight—Pounds per brake horsepower—100
Reversing—Direct; **Air Compressor**—32 cu. ft.

Vessel

Name—Sergeant Floyd; **Type**—Inspection Boat
Owner—United States Army Engineers Corp.
Builder—Howard Shipyards & Dock Co.
Main Drive—Twin screws, direct connected
Length B.P.—138 feet; **Beam molded**—30 ft.
Depth—5 feet; **Draft**—Mean, 3 ft. 1¼ in.
Displacement—Short tons, 320
Speed—Miles per hour, 13; **Propellers**—2
Fuel Consumption—Lb. per b.h.p. per hr.—0.44. Gallons per hour for each engine, 18.1. For both engines, 869 gallons fuel per 24 hours.

Generator—One Fairbanks-Morse, 40 k.w. at 800 r.p.m., driven by Fairbanks-Morse diesel.

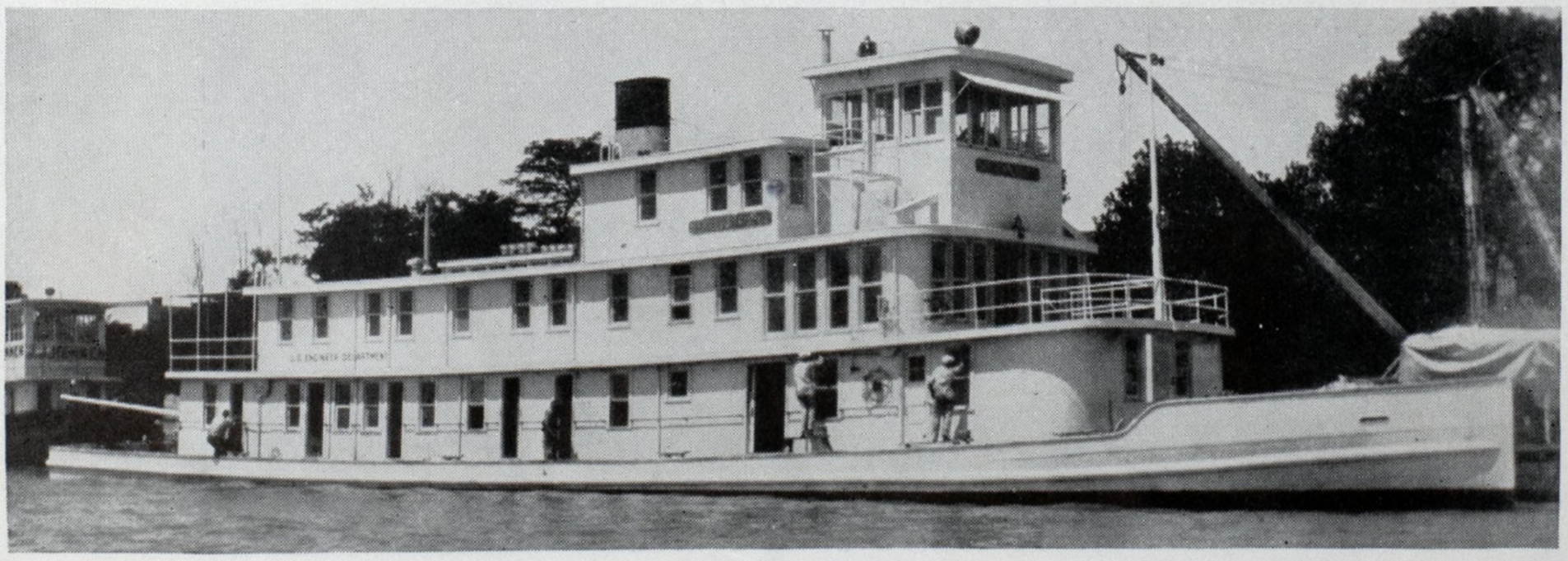
Remarks

The Sergeant Floyd is of steel hull construction with wooden superstructure. Designed to serve as an inspection boat for the United States Engineers, this vessel is assigned to the Kansas City district Engineers office for operation on the Missouri river.

In addition to being used for its primary purpose this vessel has been found useful as a towboat in moving construction materials. The boat has also been successfully used in sluicing banks. For this operation the bow is held firmly in place and the wash from the propellers effectively carries away the sediment.

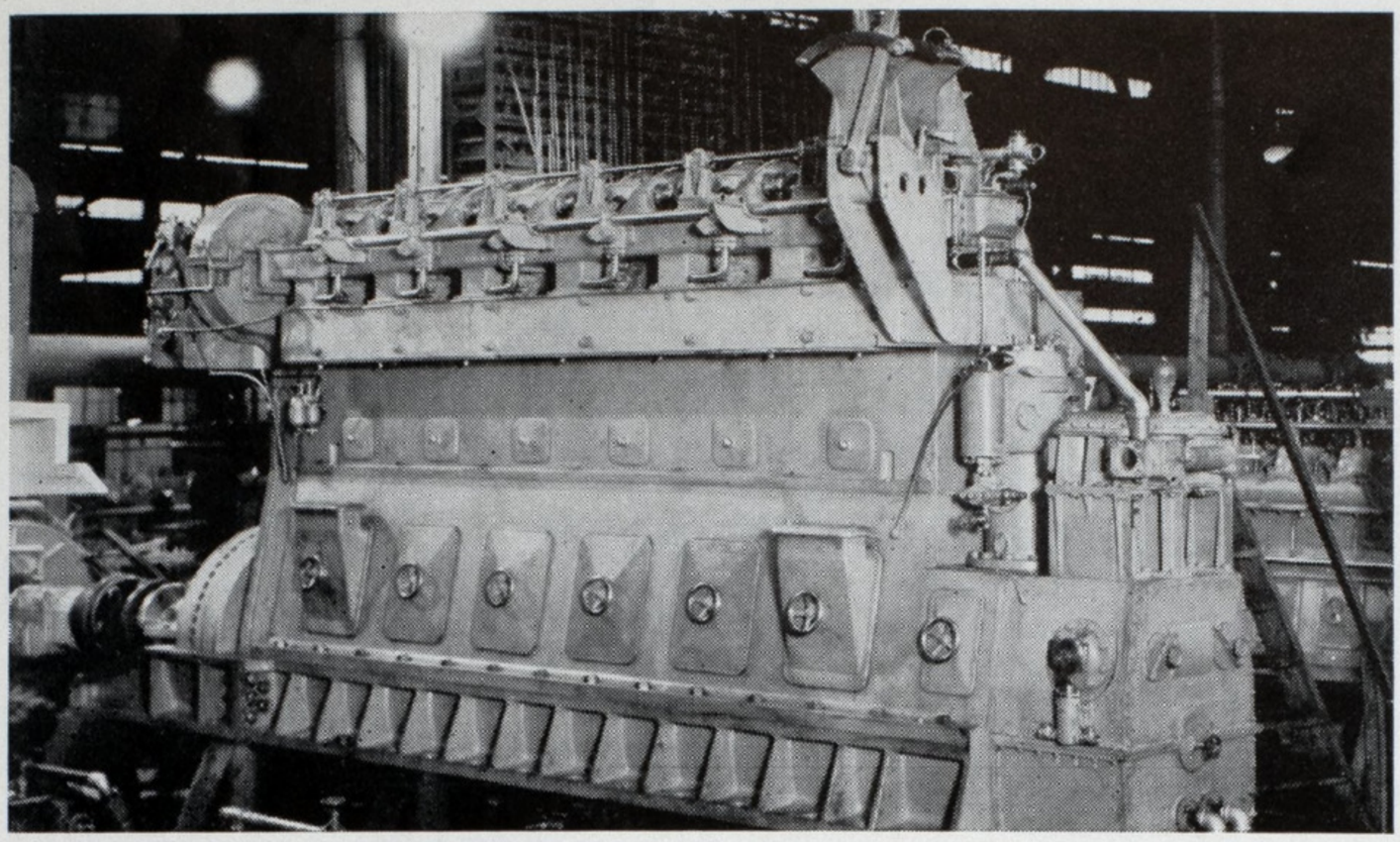
A 40-kilowatt Fairbanks-Morse diesel driven generator supplies electric current for lighting and other purposes. An auxiliary generator is driven by a belt from one of the main engine shafts.

Complete engine room control is installed and reports indicate ease and rapidity in maneuvering. A radio and all modern conveniences are installed.



Diesel Direct Drive in Tug Turecamo Girls

One Engine—600 B.H.P.



DESCRIPTION

This solid injection, six cylinder, four-cycle, diesel engine, developing 600 b.h.p. at 250 r.p.m. is direct connected to a propeller 7-feet, 10 inches in diameter by 51 inches in pitch. A machinery flat of steel above the line shaft extends forward in the engine room from the after bulkhead. The electric hydraulic steering gear is mounted on this flat and so is also a 10 k.w. generator driven from propeller shaft.

Engine

Name of Engine—Winton; **Year**—1933
Builder—Winton Engine Corp.; **Cycle**—4
No. of Cylinders—6; **Brake Horsepower**—600
Action—Single; **Injection**—Solid (airless)
Piston Coolg.—No; **Bore**—15½"; **Stroke**—22"
R.P.M.—250; **Piston Speed**—916 feet per minute
B.H.P. per Cyl.—100; **Stroke to Bore**—1.42
Length O. A.—22 ft. 2¼ in.; **Width**—4 ft. 10 in.
Height—Base to top of engine—13 ft. 11⅝ in.
Weight—One engine complete, 84,000 pounds
Weight—Pounds per b.h.p., one engine, 140
Reversing—Direct; **Air Compressor**—Attached

Vessel

Name—Turecamo Girls; **Type**—Harbor towboat
Owner—B. Turecamo Towing Co., Brooklyn, N. Y.
Builder—Bath Iron Works Corp., Bath, Me.
Completed—May 12, 1933
Main Drive—Single screw, diesel direct drive
Length B. P.—93 feet; **Beam Molded**—23 feet
Depth—11 feet; **Draft**—Mean, 8 ft. 11 in.
Speed—10.4 knots; **No. of Propellers**—one
Fuel Capacity—Diesel fuel oil, tons—49
Fuel Consumption—Lb. per b.h.p. per hr.—0.42
Aux. Generator—One 10 k.w. @ 600 r.p.m. Electro-Dynamic with Winton diesel drive

Remarks

The Turecamo Girls in design and workmanship represents the best in modern practice. The finish is unusually fine. All exterior bright work such as dead lights, door knobs, locks, mushroom ventilator caps and bell pulls are chromium plated. Crews quarters are stained, grained and varnished.

The hull conforms generally to standard tug boat practice. The lines are in good proportion. The bow is fairly high and full to give good seagoing properties. The stern is low and broad for convenience in handling lines and working tows.

WELDING ROLLED STEEL DIESEL ENGINE STRUCTURES

Part I

BY EVERETT CHAPMAN
Lukenweld Inc.

EXCESSIVE weight has prevented the diesel engine from assuming importance as a prime mover in transportation units. The transportation field, both marine and railway, has been closed to the diesel engine because of its usual specific weight ratio ranging from 40 to 250 pounds per horsepower. Many successful applications have been made in marine and railroad yard service, but these have included only the most probable ones. The possible and likely applications, such as railroad main line passenger and freight service, have been untouched.

Much of the weight involved in a diesel engine is intimately connected with that part of the structure—the crankcase—which functions to connect the main gas load with its reaction point, the main bearings. The combination of high combustion pressures and large piston diameters results in loads of large magnitude. The strict requirement of structural rigidity, coupled with the fatigue nature of the load, demand that the usual cast material be worked at low stresses, which results in the excessive weight figures constituting usual practice today.

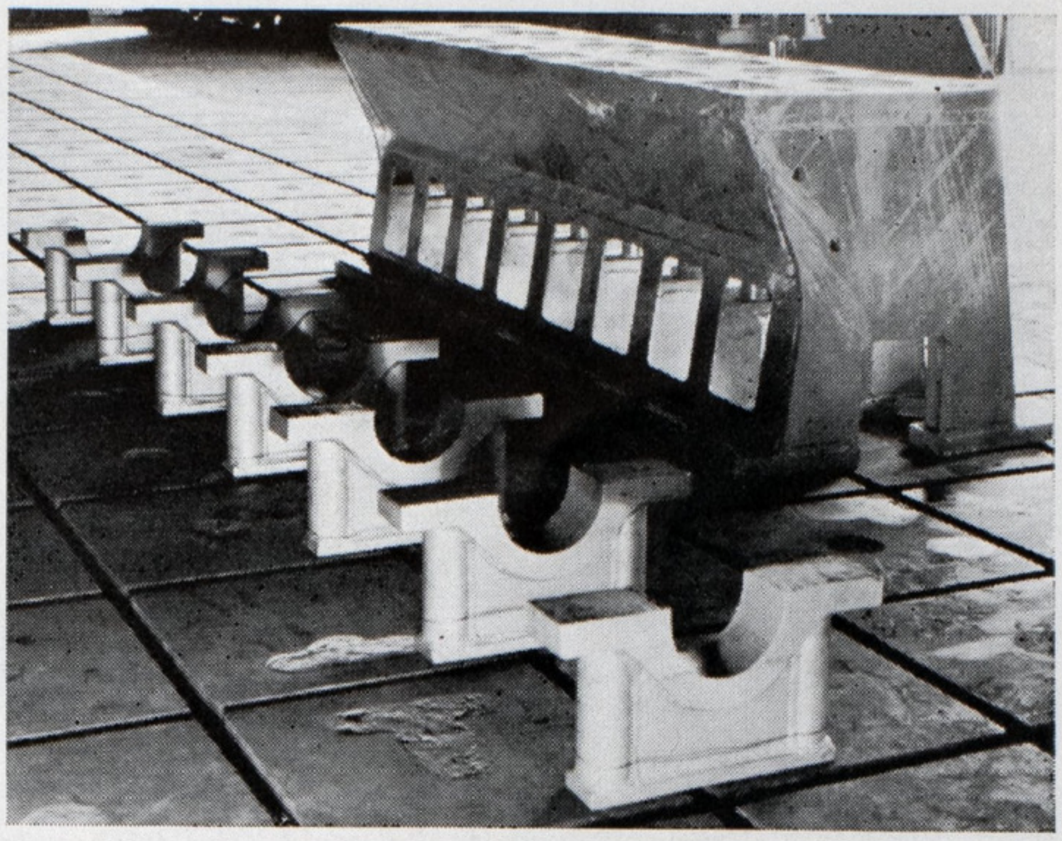


Fig. 1—An early type of welded diesel marine engine crankcase

The tension nature of the load, imposed on a material that is not well suited to tension loading, results in a composite structure consisting of steel tie rods connecting the main bearings with the cylinder heads. These rods are in turn surrounded by a cast-iron structure which supplies the necessary rigidity for minimizing vertical deflection due to the gas loads and the horizontal components resulting from the inertia loading of the crankpins and rods.

The first step in reducing the weight of the

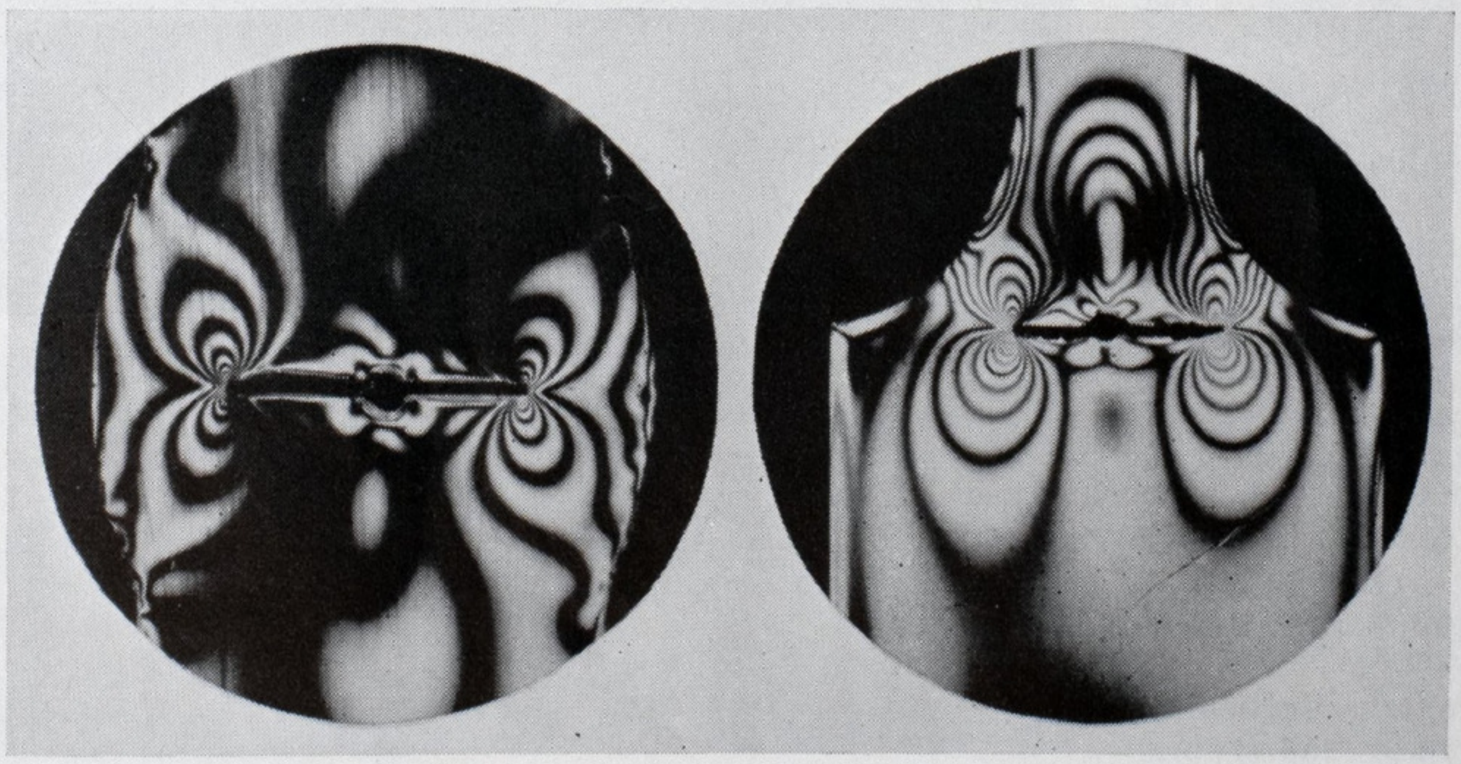


Fig. 2—Photoelastic studies of two common types of superficial welded joints. These stress concentrations cause early failure in a structure subjected to repeated loading

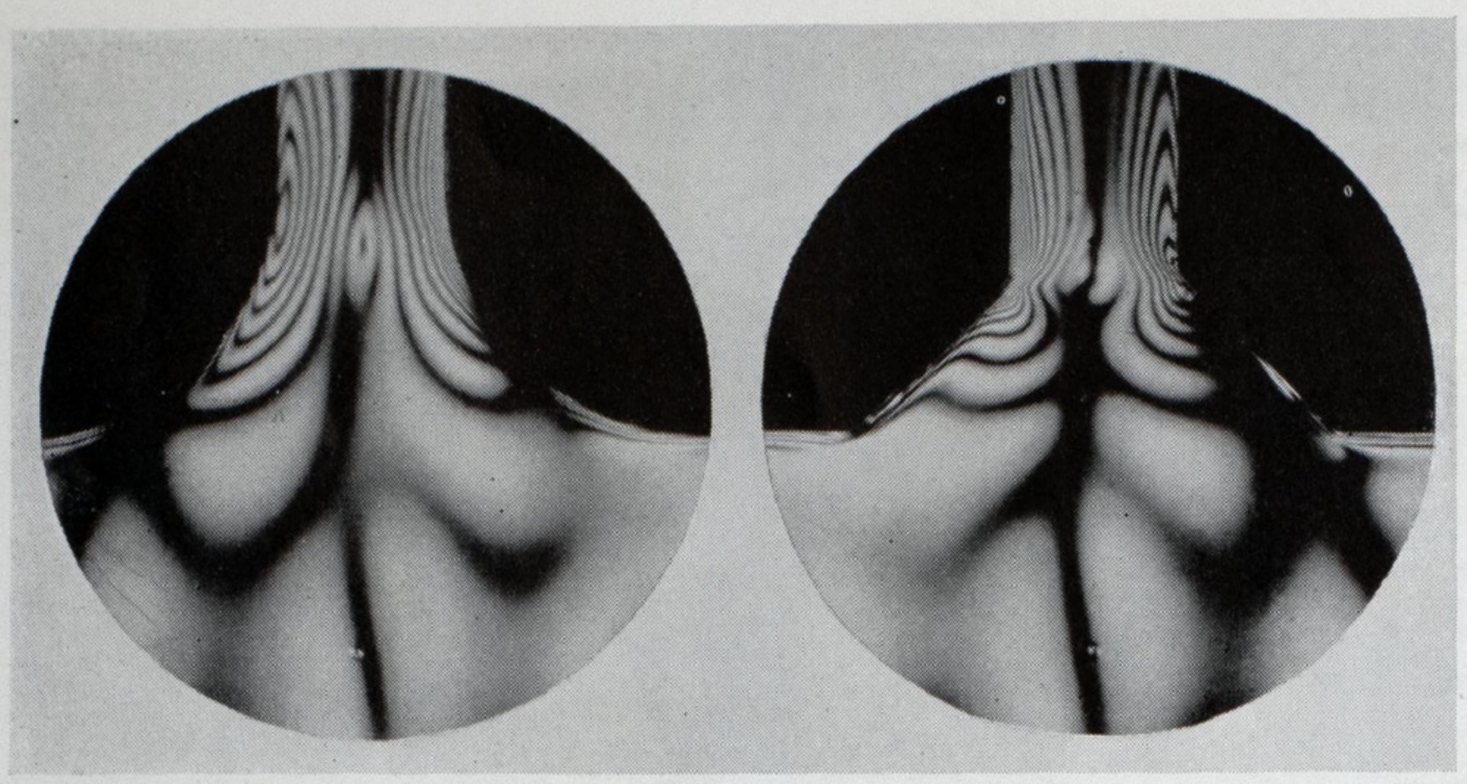


Fig. 3—Photoelastic studies contrasting stress distribution around a concave weld fillet with distribution around a weld fillet with a triangular cross section

usual arrangement naturally contemplates the use of steel as the structural material. Steel, with a modulus of elasticity of 30,000,000 in contrast to cast iron with a modulus of 12,000,000, can provide a structure of similar section working at the same stress as the old one, but with only 40 per cent of the deflection. Putting this another way, it means that the steel structure can be worked at two and one half times the stress of the cast-iron structure, and yet retain the same rigidity. Care must be taken in the application of this figure in design work, since only those areas which are axially loaded can be reduced by any such amount. In the re-design of members subjected to bending, it is the moment of inertia of the section that is reduced by 40 per cent, and this new value is used in the re-design of the section.

Endurance Limit Higher

The other physical characteristic of steel which enables a lighter-weight construction is its higher endurance limit as a fatigue-resisting material. Steel's higher ultimate strength is not a controlling factor since the engine must not break. Its higher yield point is of no advantage because the structure is useless if a permanent set occurs. Its superior ductility is important only as an index to the cleanliness of the steel. Therefore, it is obvious that the modulus of elasticity and endurance limit of steel are the only two factors which permit reduction in weight of a diesel crankcase.

Many attempts, some successful, have been made to execute the lightweight diesel crankcase in cast steel, but here again is an inhibiting factor in that cast steel will not flow in sections as thin as cast iron. Thus, limitations of the manufacturing method legislate against any appreciable weight reduction.

An alternative, then, is use of rolled steel in the form of plates and shapes to build up the desired structure. To join the components, riveting is out of the question because the nonhomogeneous and semirigid joints will not stand up under the severe service of the diesel type of loading. In contrast, welding is eminently suited as the method of fabricating the rolled steel crankcase.

Questions asked on the application of welding center about two prime requisites, stiffness and endurance life, plus a secondary factor—corrosion-resistance—which affects only those marine installations where salt water is used as a cooling medium.

Questions concerning structural rigidity are answered by the fact that steel is the stiffest commercial material known. Further, flexibility of the welding process enables the designer to use economical, efficient sections. Thus, the matter of requisite rigidity is controlled entirely by the designing department. When the structural constants are handled properly, the designer can achieve a structure of either equal stiffness and lighter weight than the old design, or obtain a structure of higher rigidity at the same weight.

The problem of endurance life can be stated rather simply although the subject as a whole is somewhat involved. In handling the severe loading conditions encountered in diesel engine work over an equitable period of time, it is necessary to study thoroughly the mechanism of fatigue failure. The essence of the matter is that the stress range through which the component materials can be repeatedly stressed indefinitely without causing failure must be known. The maximum stress in the structure, wherever it occurs, must be under the known safe value.

A low average stress as usually calculated cannot possibly guarantee an indefinite service life—it is the maximum stress which governs. A point of maximum stress may lurk in a hidden corner with too sharp a radius; it may exist in the bottoms of small tool marks; it may be present at undercuts unconsciously made during the welding process; or it may be found at any small blow-holes or porosity in the materials. In particular, in the welding process, points of maximum

THROUGH the utilization of welded steel structures, the specific weight ratios of diesel engines have been reduced from 40 to 250 pounds per horsepower to 10 pounds per horsepower, thereby making these units suitable for transportation applications. The accompanying article, the first of two, considers preliminary design; Part II, to be presented shortly, will describe the construction of a 1000-horsepower twin-six engine. These articles constitute a paper presented in Atlantic City, N. J., Aug. 23, before the Oil and Gas Power division of the American Society of Mechanical Engineers. The author is vice president in charge of engineering, Lukenweld Inc., division of Lukens Steel Co., Coatesville, Pa.

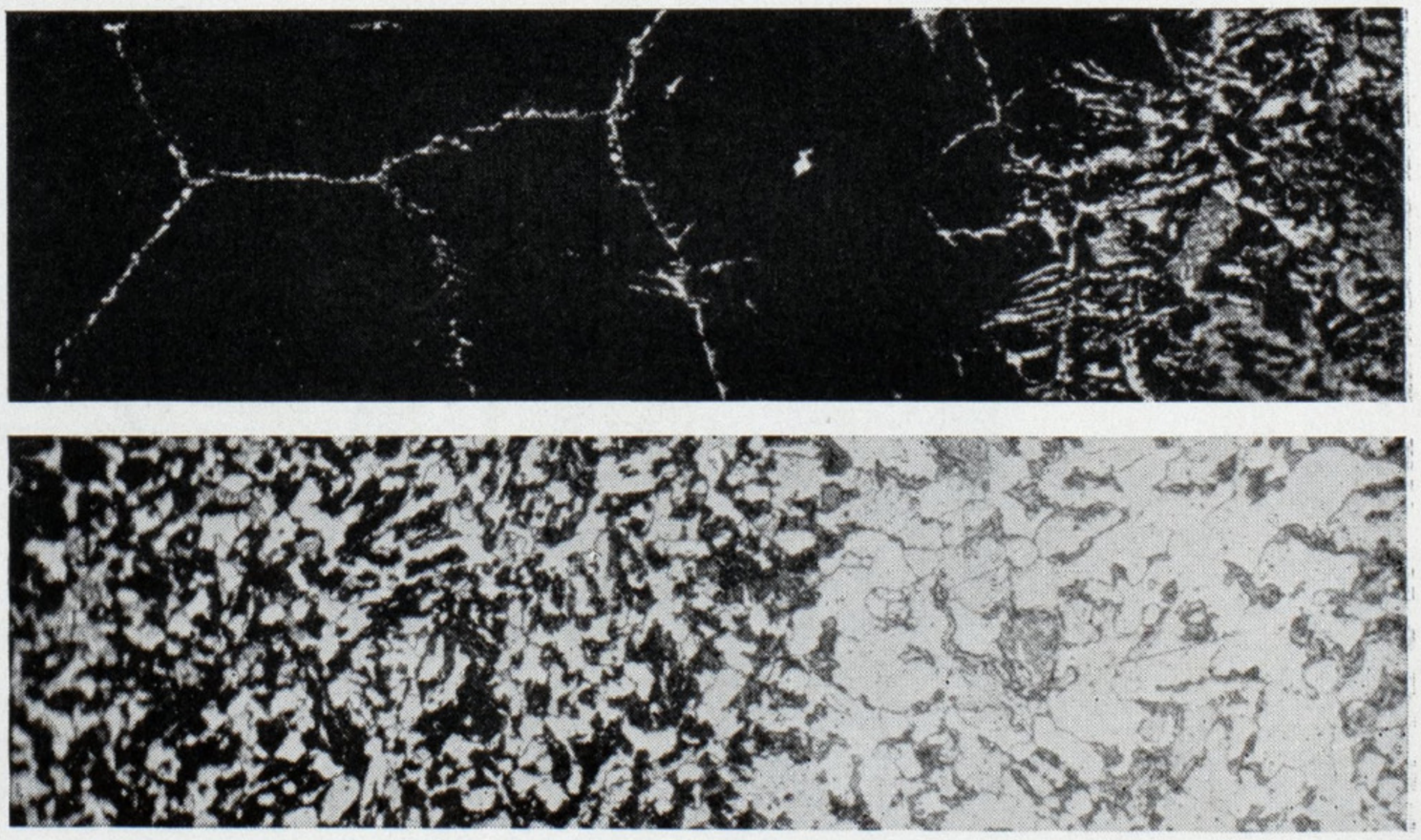


Fig. 4 (Above)—Photomicrograph at 100 diameters showing large grain size at transition zone between weld and base metal. Fig. 5 (Below)—After welding is completed, the grain structure is refined by heat treatment as shown here

stress always exist around an improperly designed welded joint. In an otherwise perfect design satisfying the rigidity requirements for successful functioning of the engine, the only thing that will break the structure subjected to repeated load is the existence of a hidden, minute defect in contour which multiplies the average stress condition by a factor of 5, 6, or even more.

Points of high local stress are evident only as fatigue failures. Such points of high stress occur over such small areas that they have no influence on rigidity. Ductility cannot operate to alleviate a high stress condition as it does in statically-loaded structures, since this phenomenon requires a permanent deformation which is inadmissible in a crankcase that must preserve main bearing alignment.

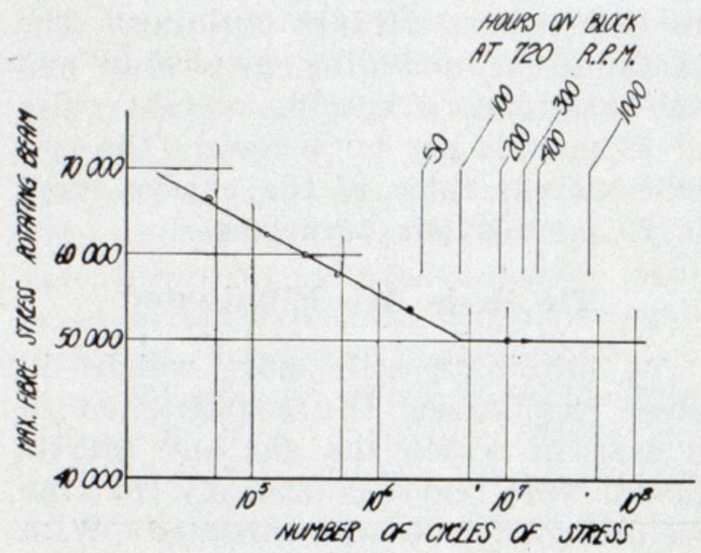


Fig. 6—Repeated stress performance of an alloy steel used in diesel crankcases of welded construction

Fig. 6 is a diagram depicting the repeated stress performance of an alloy steel which has been found most applicable to welded steel crankcases. It is an alloy steel of low carbon content and, therefore, well suited for welding. The curve shows it to have an endurance limit as determined on a rotating-beam machine of 50,000 pounds per square inch, as contrasted with the equivalent value of 30,000 pounds for ordinary mild steel plate.

Determine Safe Stress Range

A definite limiting range of stress at which the material will function for an indefinitely large number of reversals has been proved to exist for all materials. If the engine is not to fail prematurely but is to serve indefinitely, the product of the average working stress and the stress concentration factors always introduced during fabrication must not exceed this safe stress range—50,000 pounds per square inch in this case.

Stress factors of almost any magnitude can exist in a structure. A round hole in a body of material will raise the stress in its locality by a factor of 2.7. A round hole on the surface of a material will raise the stress three times. These factors are not serious since the demands of rigidity will call for average stresses which, when multiplied by these factors, will not constitute a source of worry. The serious type of stress concentrations, against which the designer must guard, are those exemplified by sharp corners and re-entrant angles.

Mathematically, the stress concentration factor which exists at a corner or re-entrant angle is inversely proportional to the radius of curvature of the corner. If it were practically possible to achieve a perfectly sharp corner, the stress theoretically would be infinite. While it is practically impossible to machine a corner with a zero radius, there are many types of welded joints in which the radius is nearer zero than can ever be approached by machining. Concentrations of this nature cannot be tolerated.

Unsound Welds Show Up

Fig. 2 illustrates photoelastically the stress distribution around an all-too-common type of welded joint. When two plates are superficially welded together, either by two welds whose roots are not fused together or by fillet welds merely laid in the corners, there is an unwelded boundary on the interior of the joint. This crack is an integral part of the contour of the joint and has a tremendous influence on the stress distribution.

This condition can be simulated elastically by cutting from a piece of bakelite the contours of the joint, including the internal crack. This specimen, when loaded and viewed by polarized light, shows the stress distribution that would exist around a similar welded joint. The concentrations which exist in the actual welded joint are even more severe. The saw blade used to cut the internal crack has a finite width, whereas the smallest dimension of the crack in the welded joint is practically zero, due to the tremendous contracting forces exerted by the cooling weld metal.

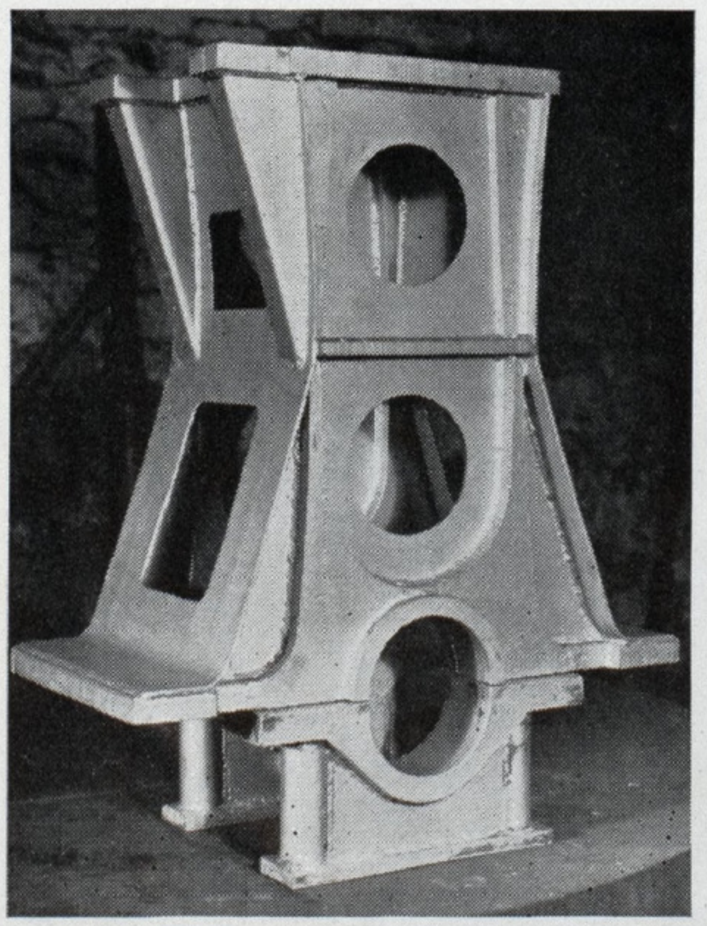


Fig. 7—A built-up single-cylinder diesel unit constructed to test efficiency of design

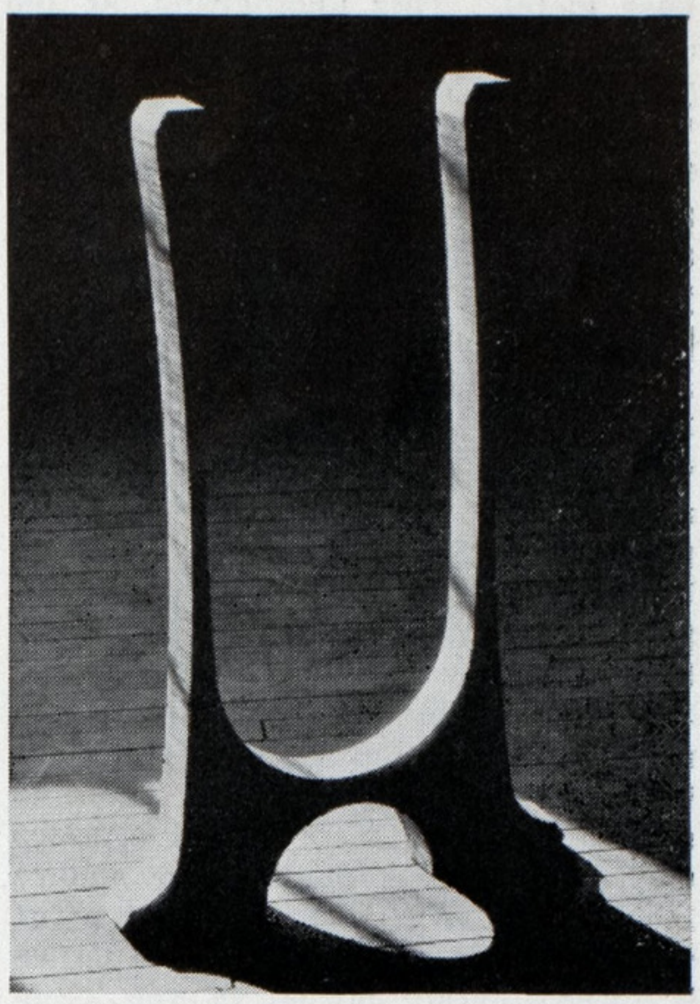


Fig. 8—The main frame of the single-cylinder unit was flame cut from a plate of 2-inch thickness

Concentrations of this nature in poorly designed welded joints have broken more welded structures than any other single cause. Such joints will function properly in statically loaded structures, since the high ductility of the weld metal can allow sufficient plastic deformation, under high load, to correct the contour. They are suicidal, however, where the structure is subjected to repeated stress.

Aim for Concave Weld Fillet

Another type of notch effect which may occur in a welded structure, and is a typical example of what a designer and fabricator must guard against, is shown in Fig. 3. It is a photoelastic study contrasting the stress distribution around a concave weld fillet with the stress distribution around a weld fillet with a triangular cross section. The triangular fillet shows marked concentrations at the ends of the weld. The concave fillet shows an evenly graduated stress, with the maximum value probably only two or three times that of the average stress. The concentration factor at the ends of the triangular weld can reach dangerous values. While the triangular-shaped weld fillet has more throat area and, therefore, a lower average stress, the maximum stress which exists is considerably higher than that around a concave fillet, although the average stress of the latter is higher because of its decreased throat.

Other points to be considered are condition of the weld, endurance value of the weld metal, and damage to the base metal by the high temperature of the welding operation. Fig. 4 shows this metallurgical damage, indicating the condition of the metal at the transition zone between the weld and the

base metal. This photograph, at 100 diameters, shows an exceedingly large grain size. Experience has shown that this enlarged grain, plus the quenching that occurs due to the cold parent metal, has the usual poor properties of the structure. It is axiom that joints never break through the weld, but always adjacent to the weld.

Fig. 5 shows how this poor condition is corrected by heat treatment of the welded structure after completion of all welding. The discontinuity in the physical properties at the fusion zone has been eliminated. Heat treatment after welding is exceedingly important, not only to correct the damage occurring during welding, but also to remove the residual stresses which are locked up in the structure. There is direct evidence that residual stresses may reach 30,000 pounds per square inch, which is nearly the yield point of ordinary material. If the structure is unfortunately loaded in the same direction as the residual stresses, there is no apparent strength.

Unannealed Structure Warps

The other important phase of stress relief is that an unannealed welded structure will warp and twist on the planer and boring mill to a degree that will render the structure useless. It will not hold its shape over any period of time. Instances have been known of unannealed welded structures which, over a period of two years, crept badly out of shape in service.

A multiplication of difficulties occurs at the edge of the weld where the metallurgical damage coincides with the severe discontinuities in weld contours. Undercutting is common with many electrodes in the hands of an inexperienced welder. With an undercut and its attendant stress concentration occurring just at this damaged zone in the parent metal, failure under repeated stress is imminent and certain. Other types of stress concentration occur in welded structures and they also must be eliminated.

The general subject of corrosion resistance of the weldable materials can be covered amply by the statement that there are many weldable materials with remarkable resistance to salt water corrosion. The flexibility of the welding process enables incorporation of these materials in the structure, where they are necessary. The admirable record of wrought iron hulls in salt water could be duplicated in the water jacket of a welded steel crankcase. The stainless steels, nickel-clad steel and other clad metals, all are possibilities. Two of the early welded engines were galvanized in the region of the water jackets and two-years in salt water service proved them to be entirely adequate.

Fig. 1 shows a 4-cycle marine engine crankcase, with its welded bearing girders. Early crankcases were of tie rod construction, the welded steel case serving as a stabilizing medium for the tie rods. It is a common misconception that the tie rods take all the load. Tie rods, if they are screwed up and set properly by means of strain gages, bring into play the rigidity of the crankcase. The material which is compressed when the rods are screwed up adds its flexural rigidity to the flexural rigidity of the rod.

It is just as important in the case of tie rod construction to eliminate stress concentrations as it is in the case of an engine in which the gas load is carried entirely by a weld. The frame is subjected to the same alternations of stress whether the tie rods are in place or not. The only condition under which the frame can be entirely relieved of stress occurs with loose tie rods. The engine shown in Fig. 1, was built of low carbon welding quality steel with endurance values for an indefinitely repeated stress of 30,000 pounds per square inch. The weld metal used to join the components had an endurance limit of 28,000 pounds per square inch established by rotating beam test on all-weld metal specimens. It was then a matter of eliminating all undercuts, unfused welded joints, and surface discontinuities of any type, since it is easy, at an average stress of 5000 pounds per square inch, to incorporate a stress factor of 5 or 6, which would legislate against indefinite service life. The crankcases weigh about 5 pounds per horsepower.

An installation of the same general type of crankcase with the exception that the two engines are 2-cycle and slight modifications were made in the cases to take care of this feature, form part of the Winton Engine Corp.'s exhibit at the Century of Progress in Chicago. These units have been in continuous operation since the opening of the fair, supplying power and light to the General Motors building. The installation, including generator and sub-base, has a specific weight ratio of 39 pounds per horsepower; the specific weight ratio of the engine itself is 20 pounds per horsepower.

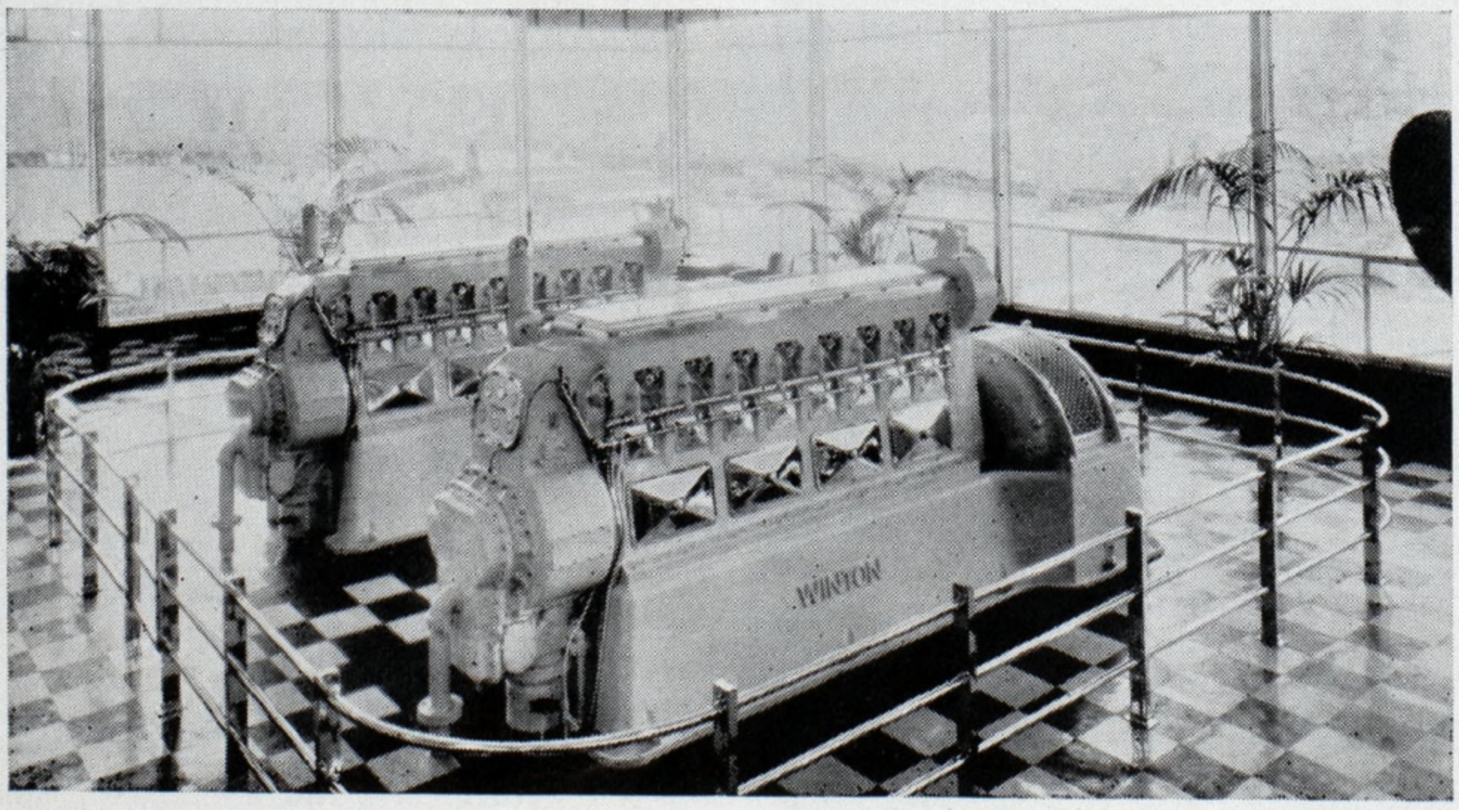
Tie Rods Are Eliminated

To eliminate still more weight in steel crankcases, the construction of a case in which the gas and inertia loads were carried entirely by the welded structure was initiated. With the tie rod type of construction, much material is not working effectively, especially if the tie rods are not set properly. In a welded unit, better distribution of the stresses can be achieved because of the monolithic construction.

An experimental single-cylinder frame was built, embodying a main frame flame-cut from a plate of steel 2 inches thick. This model was subjected to strain gage tests to determine the efficacy of the conception. Fig. 8 shows the main frame as cut out for the model test engine, and Fig. 7 shows the built-up single cylinder unit. The main frame was joined by welding to the top deck, into which the cylinder head studs were tapped. This frame showed satisfactory deflection and stress characteristics.

An effective method of determining points of maximum stress in a three dimensional structure is to paint it with a varnish possessing a low modulus of elasticity and a low yield point. When a static load is supplied to the structure, the varnish cracks at the point of maximum stress while the structure is only lightly loaded. The varnish method shows points of maximum stress with a single application of a load and the load at which the varnish cracks correlates a wealth of information about stress factors and fatigue performance. Needless to say, the varnish will crack first at those points where experience dictates a large radius. It will crack at the contours of an improper weld. It will crack at the root of an undercut.

(To be concluded)



Two-cycle diesel engines with welded steel crank cases. Part of Winton Engine Corp.'s exhibit at Century of Progress, Chicago. In continuous operation since opening of fair, supplying power and light to General Motors building. Including generator and sub-base, the weight is 39 pounds per horsepower. Weight per horsepower of engine itself is 20 pounds

Coast Guard Asks Bids for 9 Cruisers, 4 Cutters

ON OCT. 23 the United States coast guard, treasury department, Washington, requested bids for the construction of nine (9) cruising cutters designated as cutters Nos. 65-73 inclusive. The bids for the construction of these cruising cutters will be opened at 2 p.m., Nov. 28. On the same day announcement was also made that bids had been requested by the coast guard for the construction of four (4) harbor cutters. The bids for the construction of these harbor cutters will be opened at 2 p.m., Nov. 14. Both of these projects are part of the allotment made by the federal emergency administration of public works.

The nine cruising cutters on which bids are to be opened Nov. 28 have the following characteristics: Hull of steel construction; length overall, 328 feet, 6 inches; beam molded, 41 feet, 3¾ inches; depth molded amidships, 23 feet, 6 inches; draft corresponding to normal displacement, 12 feet, 6 inches; and displacement, standard, 2000 tons. These cutters are to be propelled by twin screws driven by geared steam turbines of a total estimated shaft horsepower of 6200. The completion date will be determined by prospective bidders. Specifications and drawings may be obtained by shipbuilding companies from the commandant, United States coast guard, treasury department, Washington.

The four harbor cutters on which bids are to be opened Nov. 14 have the following characteristics: Hull of steel construction; length overall, 110 feet, 6 inches; beam molded, 24 feet; depth molded amidships, 12 feet, 7 inches; draft maximum, about 10 feet 6 inches; and displacement, full load, about 290 tons. The propelling machinery is to be diesel electric, single screw. The estimated shaft horsepower is to be 800.

The first harbor cutter must be completed 300 calendar days after date of receipt of notice to proceed, and subsequent cutters at intervals of not more than 30 calendar days.

The coast guard can furnish copies of the specifications only to shipbuilding concerns, sub-contractors and material men must obtain the shipbuilders' requirements directly from the shipbuilders.

American Ships Popular

When the MANHATTAN and later the WASHINGTON entered transatlantic service, all who had the opportunity of seeing them were much impressed with their spaciousness and splendid accommodations. Here at last were two American-built transatlantic liners for which no apologies were needed.

Their record since entering service has more than met the promise of popularity. Since Aug. 10, 1932 when she sailed on her maiden voyage transatlantic for the United States lines, the MANHATTAN has carried 17,822 passengers, or an average of 1371 per round trip which considering the times is exceptionally good.

The MANHATTAN'S sistership, the WASHINGTON, sailing on her maiden voyage, May 10, 1933, has carried 7905 passengers in five round trips, or an average of 1581. This increase over the average number of passengers carried on the MANHATTAN is partly accounted for by the fact that she started in service at the beginning of the tourist rush, whereas the MANHATTAN commenced her service when this trade was declining.

It is understood that the freight carried by both vessels has been good but no definite figures can be obtained.

Both the MANHATTAN and WASHINGTON were built for the United States lines, with the aid of construction loan funds, by the New York Shipbuilding Co., Camden, N. J. and they are the largest and finest vessels of merchant type built in American shipyards up to the present time.

Oil Engines for Smaller Craft

FROM 25 horsepower up to 100 the oil engine is steadily finding favor in fishing vessels and other smaller merchant craft. Recent installations have proved satisfactory in performance and the fuel economy has materially reduced operating cost. The tendency to use the diesel engine even in the lesser sizes of fishing craft has recently become particularly noticeable both on the East and West coasts.

As an example a typical installation by the Bolinders Co. Inc. in the fishing boat EMERALD shown in the accompanying illustration is described as follows:

A two-cycle, two cylinder, solid injection, lightweight oil engine of 50 horsepower at 800 revolutions per minute was recently installed in the fishing boat EMERALD owned by Fiedler Bros., Greenport, L. I. This engine has now been in service long enough to definitely establish satisfactory performance. The boat was used with entire success in the swordfish operations of the owner. The boat is 46 feet in length, 13 feet in beam and has a draft of about 5 feet, 6 inches. Under ordinary conditions a speed of 9 to 10 miles is obtained. The engine often operates from 18 to 24 hours at a stretch without stopping. While swordfishing, the operation of the engine is controlled from the masthead, It is said to operate as smoothly and evenly as any gasoline engine. It can be throttled down to 400 revolutions per minute without difficulty. The main bearings are of the roller type and the piston pin is of the needle bearing type. The engine is arranged to start both from a quick-acting torch and electric heating elements.

Cost of operation does not often exceed $6 per week for fuel. A winch is operated through a chain drive from the main engine. The propeller supplied by the Columbian Bronze Co. is a three-bladed bronze propeller, 26 inches in diameter and 16 inches in pitch. The engine which has a height of 34 inches above the center line of the crankshaft is installed under the pilot house floor. The cylinders of the engine are 7⅛ inches in diameter, and the stroke is 7⅛ inches. Similar engines are built in 25 and 100 horsepower sizes, with the normal rating at 800 revolutions per minute with a maximum of 1000 revolutions if necessary. The weight of this type of engine is about 33 pounds per horsepower.

Swordfishing Boat, Emerald, owned by Fiedler Bros., Greenport, L. I., fitted with 50 horsepower Bolinders oil engine

Late Decisions in Maritime Law

Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review
By Harry Bowne Skillman
Attorney at Law

WHERE sailors of a United States merchant vessel were not divided into equal watches as provided by law, but the firemen and oilers were, fireman was entitled to discharge and wages earned; the fact that the vessel carried more seamen than was required by its certificate of inspection did not relieve the ship from compliance with the requirements of the statute—the additional men should also have been divided into watches. However, the statute providing that an extra month's pay and passage home for seamen of a United States merchant vessel discharged in a foreign country does not apply to a seaman who demanded discharge and wages because of failure to divide sailors into equal watches.—AMERICAN SHIPPER, 3 F. Supp. 184.

* * *

A TUG is not a common carrier in relation to the tow and is only bound to the exercise of ordinary care and liable only for negligence, and where the tow agrees to assume all risks, the only risks for which it is liable are the consequences of her own negligence.—PRIMROSE, 3 F. Supp. 267.

* * *

RECEIVERSHIP, it was declared in the case of PACIFIC HEMLOCK, 3 F. Supp. 305, did not suspend seamen's liens for wages, where, after the libeling of vessels and appointment of a receiver, the owners and the receiver were interested in having the crews remain on the vessels, to maintain them in equipped and active relation for instant operation in undertaking any voyage, the maintenance of condition and relation being of value and all performed on the credit of the ships. This was true, in this case, though it is the law that seizure of a vessel under a libel breaks up the articles of seamen and no lien attaches while the vessel is in custodia legis.

* * *

DRIFTING vessels colliding with moored vessels are presumed to be at fault; a defendant, in a collision suit, relying upon inevitable accident as a defence, where the cause of accident is shown, must show that he could not have prevented the accident by the exercise of much care and skill; if, however, the cause is not shown, then defendant must show all possible causes, and that he was not responsible for any of them.—BROOKLYN, 3 F. Supp. 315.

* * *

THE choice of what should be done in navigating a vessel in a fog should be left to the decision of the expert on the spot if there is a fair choice between the possible courses to be followed. PROVIDENCE, 3 F. Supp. 461.

* * *

CONSIGNEE and wharfinger must use reasonable care to provide a safe berth and give due notice of the known existence of any dangerous obstruction.—Sargent Barge Line v. New York Silk Dyeing Co., 3. F. Supp. 566.

* * *

IT IS THE duty of a shipowner, in providing a cargo-worthy vessel, to make it fit for the cargo carriage undertaken.—J. L. LUCKENBACH, 65, F. (2d) 570.

* * *

PURPOSE of the limitation of liability statute was to exempt owners, beyond the value of the vessel and freights due, from the consequences of the acts, contractual or tortious, of the master, crew, or agent regulating the vessel beyond the control or supervision of the owner. The contract of the master or other agent on the voyage or in foreign ports bind only the ship. But the reason of that rule should forbid its application to contracts of charter hire entered into by an agent of the owner with full authority and under immediate supervision of the owner no matter how subordinate a position the agent may occupy in the organization of a corporate owner. * * * The implied warranty of seaworthiness is a promise to pay for the consequences of unseaworthiness, and where the captain of a vessel has authority to enter into a contract which implied a warranty of seaworthiness, the authority thus conferred upon him results in the owner being bound by his implied authority.—FRED E. HASLER, 65, F. (2d) 589.

* * *

TUG which proceeded for a distance of almost one and one-half miles to a point where she had reason to believe there would be danger without taking adequate steps to avoid collision with a steamer she saw backing from her slip into the Hudson river held negligent though she was burdened with a heavily loaded hawser tow and a strong tide underfoot.—AMERICAN EAGLE, 3 F. Supp. 717.

* * *

THE courts have been consistent in holding that notice of claim clauses in bills of lading must be complied with unless unreasonable in the circumstances and that cargo owners bear the burden of proving compliance. When the time in which the notice must be given is the question, the test of reasonableness is applied, and, where the time stated is unreasonable, notice is not excused entirely, but it must be given within a reasonable time. Where the sufficiency of notice rather than the time of notice has been brought into question, compliance with a reasonable notice clause has been required. Notice of damage is not notice of claim for damage, and the shipowner's knowledge that damage has occurred does not remove the necessity of giving notice of claim. A test of reasonableness of clause requiring claim for cargo damages within a specified time considers, not the utility of the provision, but the cargo owner's ability to comply with it in the circumstances. A clause requiring notice and written demand for payment of claim within ten days after delivery, interpreted as requiring demand but not necessarily statement of exact sum, held not unreasonable.—J. L. LUCKENBACH, 65, F. (2d) 570.

* * *

OWNER of a vessel has a right to limit his liability, on proof of certain facts, to his interest in the vessel, and the mere fact that there is but one claim filed, provided it is large enough, does not affect the situation. The justice, in fact, the very purpose of the admiralty proceeding to limit liability, is to limit the liability of the owner to the true value of his or its interest in the vessel. Unless the owner surrenders his vessel and substitutes therefor by payment in the court or by stipulation the true value of his interest in the vessel, such owner is not entitled to limit his liability.—KEARNY, 3 F. Supp. 718.

Marine Business Statistics Condensed

Record of Traffic at Principal American Ports for Past Year

New York

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	269	1,663,403	277	1,633,829
August	277	1,656,291	280	1,676,614
July	270	1,477,769	256	1,397,794
June	249	1,482,801	264	1,580,337
May	255	1,573,337	244	1,513,231
April	232	1,330,774	232	1,311,863
March, ...	243	1,466,812	264	1,536,778
February	237	1,373,856	236	1,380,867
January	254	1,416,857	245	1,383,630
December, 1932.....	244	1,307,332	253	1,387,341

Philadelphia

(Including Chester, Wilmington and the whole Philadelphia port district)
(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	65	182,418	44	126,290
August	61	181,283	61	178,894
July	69	203,042	53	151,781
June	51	152,234	54	149,616
May	58	157,704	49	141,334
April	63	193,946	41	131,990
March	60	192,817	43	141,445
February	38	105,262	20	56,395
January	53	154,823	41	142,216
December, 1932.....	44	141,426	37	116,120

Boston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	110	348,981	80	279,531
August	129	453,348	101	329,686
July	124	410,500	96	379,721
June	118	378,179	93	303,239
May	111	295,854	83	254,667
April	86	271,864	69	226,862
March	85	259,203	65	240,768
February	83	285,162	53	191,084
January	97	329,575	56	211,428
December, 1932.....	98	300,132	64	241,693

Portland, Me.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	15	26,225	12	28,028
August	16	28,877	18	32,727
July	11	24,324	9	23,063
June	11	24,615	12	26,271
May	13	19,020	13	23,395
April	5	9,254	5	7,387
March	9	24.186	10	23,989
February	19	52,001	19	48,913
January	14	35,038	13	34,153
December, 1932.....	17	43,705	16	40,396

Providence

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	2	4,430	5	13,279
August	6	11,862	4	10,186
July	3	6,171	2	9,465
June	6	16,192	2	4,437
May	3	10,490	3	3,834
April	8	30,156	2	5,650
March	4	17,052	....	.....
February	7	27,520	1	4,393
January	2	7,473	1	3,171
December, 1932.....	3	7,918	2	8,820

Portland, Oreg.

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	25	97,576	38	141,839
August	22	83,506	34	129,908
July	26	99,339	29	111,559
June	20	78,651	34	120,089
May	25	98,688	28	105,115
April	17	67,220	24	97,104
March	20	79,537	43	162,970
February	25	97,554	34	130,014
January	24	95,271	33	138,372
December	22	92,267	41	166,858
November, 1932....	19	78,628	41	157,544

Baltimore

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	85	273,994	84	270,189
August	95	299,114	98	307,841
July	91	272,589	90	282,788
June	65	205,724	71	240,487
May	79	237,046	78	229,333
April	63	198,940	58	178,957
March	72	228,806	72	223,594
February	63	195,299	75	226,672
January	77	247,903	78	252,052
December	75	238,598	68	224,544
November, 1932....	80	254,047	83	262,796

Norfolk and Newport News

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	10	24,615	24	53,036
August	8	16,472	34	68,011
July	16	32,370	34	71,798
June	16	30,163	31	60,544
May	18	33,521	32	68,941
April	14	39,010	36	100,485
March	18	56,097	42	111,038
February	16	49,213	36	82,544
January	20	58,470	33	76,493
December, 1932.....	28	77,286	38	92,621

Jacksonville

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	8	11,528	7	13,086
August	7	12,477	7	13,152
July	13	22,553	11	25,670
June	9	22,192	6	12,222
May	5	13,102	9	16,275
April	3	8,297	8	20,260
March	7	18,536	9	18,137
February	6	15,126	7	13,454
January	3	4,683	8	21,018
December, 1932.....	10	24,067	10	24,595

Key West

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	22	38,648	23	38,659
August	18	33,210	18	32,716
July	24	39,400	22	37,180
June	27	40,569	27	42,160
May	41	55,097	39	59,075
April	41	50,121	35	47,458
March	42	57,720	39	54,508
February	37	52,615	34	49,320
January	38	55,322	38	54,692
December, 1932.....	38	59,058	39	58,604

Mobile

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	116	265,547	113	266,183
August	100	223,940	102	203,716
July	110	221,610	114	236,622
June	97	206,147	91	183,736
May	95	210,743	105	231,000
April	105	209,469	109	235,429
March	96	234,328	91	206,064
February	80	184,669	83	200,850
January	100	232,451	91	201,671
December, 1932.....	86	204,295	92	209,061

Seattle

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	151	496,684	149	513,291
August	183	604,618	161	573,703
July	166	545,372	169	554,228
June	36	160,127	36	157,887
May	37	149,245	38	164,025
April	41	188,899	40	180,517
March	47	194,485	51	216,803
February	43	196,979	43	190,338
January	50	212,954	49	210,083
December, 1932.....	45	202,731	47	207,521

New Orleans

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	154	443,981	168	470,271
August	144	420,570	151	429,183
July	169	468,111	184	493,775
June	147	422,280	146	422,235
May	150	444,982	151	434,952
April	142	409,411	154	416,833
March	161	464,728	161	457,880
February	128	378,040	127	366,948
January	135	307,750	145	410,412
December	151	434,935	157	450,545
November, 1932....	146	442,427	156	457,621

Charleston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	42	116,048	32	83,944
August	33	92,987	27	76,881
July	35	102,115	29	82,742
June	32	84,362	28	75,023
May	21	53,125	20	49,888
April	19	49,280	20	52,449
March	35	99,612	29	83,243
February	24	65,228	24	65,218
January	28	83.545	23	65,063
December, 1932.....	24	58,943	24	63,086

Galveston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	10	19,602	94	277,642
August	19	44,012	69	205,442
July	22	33,718	77	213,821
June	27	56,231	79	227,842
May	27	58,632	86	261,124
April	27	64,360	73	215,020
March	19	34,677	83	239,683
February	17	29,935	69	200,485
January	23	43,723	79	235,748
December	24	39,491	103	311,999
November, 1932....	29	64,016	102	314,452

Los Angeles

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	154	562,597	152	561,294
August	156	578,255	156	605,610
July	165	641,116	152	601,731
June	189	670,782	171	671,704
May	190	600.184	185	630,905
April	178	625,508	190	614,741
March	152	550,205	167	599,191
February	143	528,613	155	543,628
January	162	633.944	169	668,576
December, 1932.....	152	538,392	156	560,901

San Francisco

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	150	654,888	141	658,887
August	174	748,739	170	743,918
July	156	710,857	154	717,664
June	162	715,236	162	738,436
May	160	717,412	161	680,493
April	138	733,163	150	652,593
March	145	667.902	156	693,893
February	145	658,005	144	621,439
January	154	672,230	147	657,934
December, 1932.....	135	608,843	170	579,362

Houston

(Exclusive of Domestic)

Month	—Entrances— No. ships	Net tonnage	—Clearances— No. ships	Net tonnage
September, 1933....	20	70,827	27	89,893
August	22	91,240	31	117,641
July	33	122,722	40	153,173
June	28	96,996	34	118,058
May	32	127,718	43	164,896
April	20	80,016	29	103,049
March	16	71,995	28	101,486
February	20	71,711	28	95,755
January	19	72.798	33	110,421
December, 1932.....	13	45,319	30	95,323

Note: The figures given in this table are for direct entrances and clearances. Additional vessels in foreign trade enter and clear from and to other American ports after original entry and before final departure. At the port of Philadelphia, for instance, additional vessels in the foreign trade in this category were 76 of 249,979 net tons entered and 71 of 242,162 net tons cleared for the month of September.

Latest Data on New Marine Work

Information on New Ships Ordered—Building and Repair Contracts Let—Shipping Board Loans Made, Authorized or Pending

SHIPBUILDING in American shipyards for private owners, of units under construction and not yet launched, on Sept. 1 amounted to 61 vessels aggregating 35,919 gross tons, compared with 64 vessels of 37,856 gross tons on Aug. 1.

Of the vessels under construction two passenger and cargo ships of 4800 gross tons each are under construction at the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. for the A. H. Bull Steamship Co., New York; one passenger and cargo vessel, for the Northwest to Alaska trade, of approximately 1400 gross tons is under construction at the Lake Washington Shipyards, Houghton, Wash. for the Northland Transportation Co , Seattle.

The remaining 57 vessels of 24,319 gross tons of steel construction, with the exception of a ferry of 1000 gross tons for the Virginia Ferry Co., being built by The Pusey & Jones Co., Wilmington, Del. are mainly unrigged steel barges for river and coastwise service. There is also one wooden vessel of 600 gross tons under construction.

S. S. President Madison

No decision has yet been reached regarding the elaborate rebuilding of the transpacific liner PRESIDENT MADISON, which listed and sank at a Seattle pier last March and was subsequently raised at a heavy cost. The machinery and furnishings were irreparably damaged. Bids were received in July for complete reconditioning. Todd Dry Docks Inc., Seattle, was the low bidder at approximately $1,000,000.

No definite action has been taken by the owner with reference to rebuilding the vessel, as apparently she is not immediately needed for service. In the meantime she is lying at Seattle awaiting the decision by her owner, the American Mail line.

To Ask Bids for Tenders

In the September MARINE REVIEW it was reported that the bureau of lighthouses, department of commerce, had postponed to a later date its invitation to shipbuilders to submit proposal for the construction of two new lighthouse tenders to be known as the TAMARACK and HOLLYHOCK.

Briefly the characteristics of these two vessels are: TAMARACK; single screw; diesel electric; length overall, 124 feet, 2¾ inches; beam molded, 29 feet; minimum depth, 10 feet; shaft horsepower of the electric propelling motor to be 450 at 400 revolutions per minute; two diesel engine driven generators to supply power; speed to be 10¼ knots.

HOLLYHOCK; twin screw steam; length overall, 174 feet, 6½ inches; beam molded, 32 feet; minimum depth, 14 feet, 6 inches; two triple expansion reciprocating steam engines with a combined total of 1000 indicated horsepower at 150 revolutions per minute.

On Oct. 20 word was received from the lighthouse bureau that no contracts had yet been awarded for the construction of these two tenders, and that new bids would be requested in the near future.

To Rebuild Ferry Peralta

The Puget Sound Navigation Co., Seattle, has purchased the steel hull of the turbine electric ferry PERALTA, sometime ago severely damaged by fire, from the Key Route, San Francisco. The PERALTA has been towed to Seattle where she is to be converted from her original turbine electric drive to direct connected diesel drive.

Though her upper works were destroyed by fire, the hull is reported intact. She was built in Oakland completed in 1927, and has a length of 256 feet between perpendiculars; beam molded, 37 feet; and depth molded, 21 feet.

Her steam machinery will be replaced by a 3000 horsepower diesel engine which had not yet been purchased as this is written. The house will be rebuilt with glass enclosed observation rooms and she is to have all the facilities of a first class day passenger and automobile ferry. With her new diesel engine her speed will be increased from 16 knots to from 18½ to 19 knots. She is to operate between Seattle and Bremerton, Wash., a distance of 16 miles. When placed in service she will not only be the largest but the fastest ferry in local or north Pacific waters.

The PERALTA as rebuilt will be double ended and will accomodate 115 automobiles and 3000 day passengers. The 3000 horsepower diesel engine will be connected to a single shaft and propeller.

About a year ago the same owner remodeled the steel passenger steamer CHIPPEWA, into a passenger and automobile carrier, replacing her steam plant with a 2200 horsepower Busch Sulzer diesel engine. To date the CHIPPEWA'S diesel unit is the largest in operation in Puget sound, and the owner states that she has been an unqualified success, operating costs having been cut in two while the speed has been materially increased. It was the experience with the CHIPPEWA that prompted the owner to purchase the PERALTA and to rebuild her for the needs of the local route. Capt. A. M. Peabody is president and J. E. Murphy is port engineer of the Puget Sound Navigation Co.

Two more vessels of the Shepard line, intercoastal service, are having accommodations installed for a number of passengers. Such accommodations have already been provided for 16 passengers on the TIMBER RUSH and the EXANTHIA which has been chartered has accommodations for 14 passengers. In all, the line now has five vessels fitted with accommodations for passengers.

United States Engineers

The United States engineer office, Rock Island, Ill., is advertising for bids for the construction of Lock No. 21, Mississippi river, in the vicinity of Quincy, Ill. Bids are to be opened at 2 p.m. Nov. 7.

The dimensions of the main lock are 600 feet long, by 110 feet wide, and the auxiliary lock when completed will be 380 feet long by 110 feet wide. The length of each of the guide walls is 600 feet. The overall length of the main lock and guide wall is 1940 feet.

Mitering lock gates are to be supplied. Operating machinery will include electric motors but not electric wiring or control equipment for the four gate leaves of the main lock and the four tainter valves of the main lock. The work is to be carried out as a part of the approved program for public works under the national industrial recovery act. R. A. Wheeler, major, corps of engineers, is district engineer.

The United States Engineer office first Chicago district, 533 North Michigan avenue, Chicago, through Dan I. Sultan, lieutenant colonel, corps of engineers, district engineer, on Oct. 9, requested bids to be opened Nov. 9 for the construction of two open deck steel barges delivered afloat at Joliet, Ill.

Two Yards Receive Orders for Coast Guard Ships

The United States coast guard, treasury department, Washington, on Oct. 18 announced the award of contract for the construction of three 165-foot cruising cutters, at a cost not to exceed $499,800 each, to the Pusey & Jones Corp., Wilmington, Del. At the same time contract was awarded the Defoe Boat & Motor Works, Bay City, Mich., for the construction of two 165-foot cruising cutters at a cost not to exceed $563,-800 for each.

The bids of the two successful shipyards were the lowest, received on Oct. 9, from eight private yards and one navy yard. The bid from The Pusey & Jones Corp. called for the use of Westinghouse Electric & Mfg. Co. geared steam turbines and Foster Wheeler boilers; while the bid from the Defoe Boat & Motor Works called for De Laval geared steam turbines and Babcock & Wilcox boilers.

Other bids received were as follows: Manitowoc Shipbuilding Corp., De Laval propelling machinery, Babcock & Wilcox boilers, $576,000 for each of two and $567,000 for each of three; General Engineering & Dry Dock Co., depending upon make of propelling machinery and boilers varying from $607,700 to $616,700 for each of two and $600,000 to $609,000 for each of three; Moore Dry Dock Co., $620,291 for each of two and $608,724 for each of three, giving choice of General Electric, Westinghouse or De Laval propelling machinery, and Babcock & Wilcox or Foster Wheeler boilers. Under similar conditions United Dry Docks Inc. bid $635,000 for each of two and $615,000 for each of three. The Maryland Dry Dock Co. bids were from $667,875 to $683,275 for each of two and $644,661 to $661,661 for each of three depending on make of propelling machinery and boilers. The Southern Shipyard Corp. put in one bid of $899,000 for each of two cutters without specifying propelling machinery or boilers. The Charleston navy yard put in a bid of $754,000 for each of two cutters and $728,000 for each of three cutters, with choice of General Electric, Westinghouse or De Laval propelling machinery, and Babcock & Wilcox boilers.

These five cutters (in the original bids, only three were called for) are to be similar in practically all respects to the cutter ESCANABA, completed in November, 1932 by the Defoe Boat & Motor Works and fully illustrated and described in the January, 1933 MARINE REVIEW.

Repairs to Lightship

Bids for general reconditioning to hull and machinery of LIGHTSHIP 86 laid up at Wood's Hole, Mass., were recently received as follows: Low bidder, General Ship and Engine Works, East Boston, $55,840—work to be completed in 150 days. Other bids were Brewer Shipyard, New York, $64,316 and 88 days; United Dry Docks, New York, $68,796 and 60 days. I. L. Snow, Rockland, Me., put in a bid of $63,643 and 140 days and the Bowton navy yard put in a bid of $81,653.51 and 80 days. Award had not yet been made as this is written.

Awarded Barge Contract

A contract for the construction of one steel, non-propelled, tank barge has been awarded to the United Dry Docks Inc., New York, by the Studerus Oil Co., Kearny, N. J. The barge is to be 100 feet long, 30 feet wide, and 8 feet deep. The capacity will be 150,-000 gallons and the barge is to be constructed on the patented 'truss-weld' system. Construction was started immediately upon receipt of the order on Oct. 3 at the Staten Island, N. Y. plant of the company.

The United States submarine CACHALOT was launched Oct. 19 at the United States navy yard, Portsmouth, N. H. The CACHALOT is 274 feet long and is one of the most modern vessels of her type being equipped with all of the latest safety devices. Her surface speed is to be 17 knots.

U. S. Coast Guard Requests Bids for Patrol Boats

On Oct. 3 the United States coast guard, treasury department, Washington, requested bids for the construction of nine (9) 165-foot patrol boats. Bids were to be opened 2 p.m., Oct. 25. These patrol boats have the following characteristics: hull of steel construction; length overall, 165 feet; beam molded, 25 feet, 3 inches; depth molded amidships, 13 feet; draft maximum, 8 feet, 6 inches; displacement full loaded, 337 tons; propelling machinery, twin screw; diesel engines, direct conected of 1300 total estimated shaft horsepower.

The first patrol boat is to be completed 300 calendar days after official notice to proceed and subsequent boats are to be delivered at intervals of not more than 20 calendar days.

Bids are to be considered only from shipbuilding concerns who now have established shipbuilding facilities for ship construction work of the character described and who possess satisfactory financial resources and technical organization to assure completion in the contract time. Partial payments will be made and liquidated damages will be $100 per day.

The coast guard is furnishing copies of the specifications only to shipbuilding companies. Subcontractors and suppliers of material must obtain the requirements for these boats directly from the shipbuilders.

It is understood that these nine patrol boats will be generally similar to the ARGO and GALATEA described in the April, 1933 MARINE REVIEW.

Tank Barge Launched

An 11,000 barrel ship shape oil barge, MCWILLIAMS 101, built on the patented reverse channel system, was launched Oct. 18, at the Staten Island plant of United Dry Docks, Inc. The owner is Jas. McWilliams Blue Line, Inc., New York.

The new vessel is 176 feet long, 40 feet 8 inches beam and 14 feet depth, and will be followed in early November by a sister ship to be known as MCWILLIAMS 102.

Bunker Prices

At New York

	Coal Alongside per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
Oct. 18, 1933	5.00@5.75	1.15	4.70½
Sept. 18	4.45@4.75	1.15	4.70
Aug. 18	4.45@4.75	.90	4.32
July 18	4.30@4.60	.90	4.32
June 18	4.30@4.60	.80	4.08
May 18	4.30@4.60	.80	4.08
Apr. 18	4.30@4.60	.80	4.08
Mar. 18	4.30@4.60	.80	4.08
Feb. 18	4.30@4.60	.80	4.08
Jan. 17	4.50@5.00	.80	4.08
Dec. 16, 1932	4.50@4.75	.80	4.75

At Philadelphia

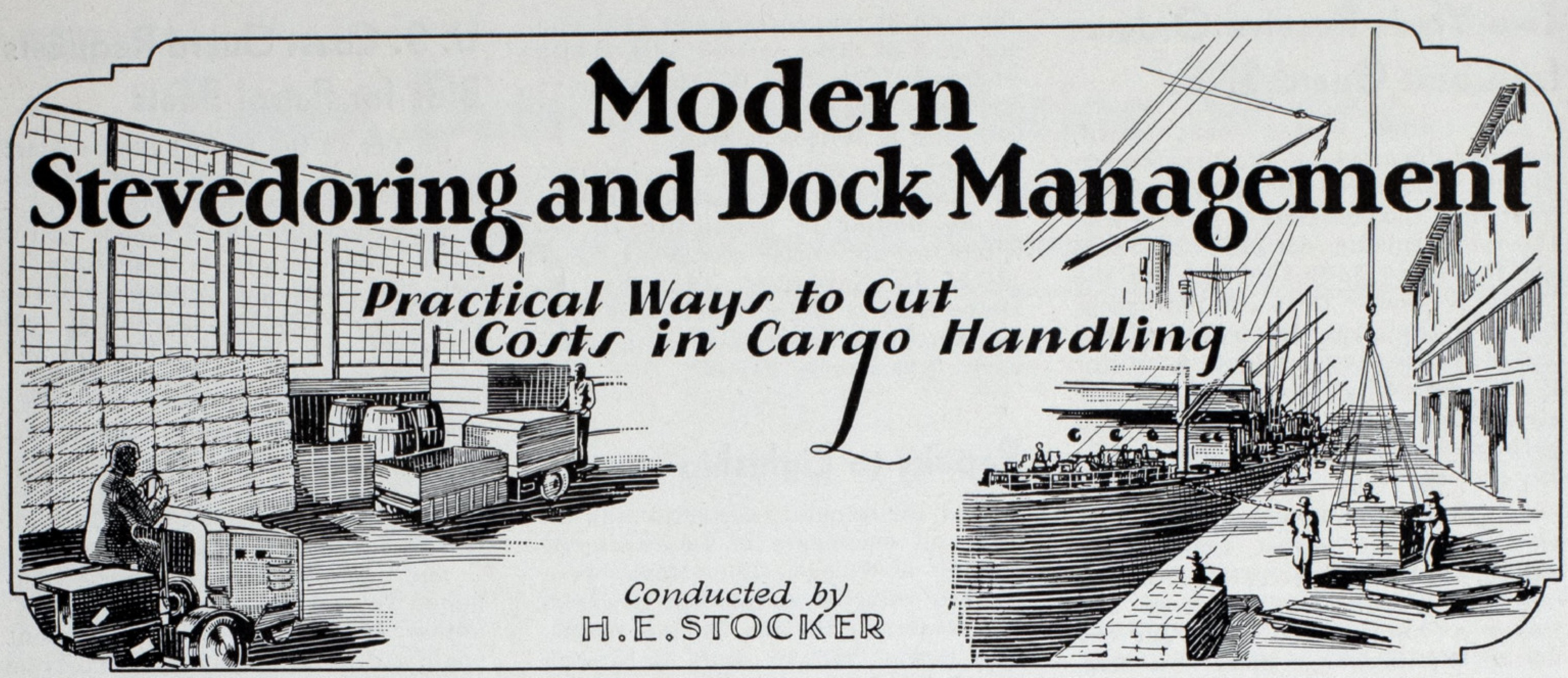
	Coal trim in bunk per ton	Fuel oil alongside per barrel	Diesel engine oil alongside per gallon
Oct. 18, 1933	5.00@5.75	1.15	4.76
Sept. 18	4.45@4.75	1.15	4.88
Aug. 18	4.45@4.75	.90	4.28
July 18	4.30@4.60	.90	4.28½
June 18	4.30@4.60	.80	4.04
May 18	4.30@4.60	.80	4.04
Apr. 18	4.30@4.60	.80	4.04
Mar. 18	4.30@4.60	.80	4.04
Feb. 18	4.30@4.60	.80	4.04
Jan. 17	4.50@5.00	.80	4.04
Dec. 16, 1932	4.00@4.75	.80	4.04

Other Ports

Oct. 18, 1933

Boston, coal, per ton	$8.00
Boston, oil, f. a. s. per barrel	$0.98½
Hampton Roads, coal, per ton, f.o.b. piers	$0.89
Cardiff, coal, per ton	13s 9d
London, coal, per ton	—s —d
Antwerp, coal, per ton	17s 0d
Antwerp, Fuel oil, per ton	67s 6d
Antwerp, Diesel oil, per ton	82s 6d
British ports, Fuel oil	87s 6d
British ports, Diesel oil	102s 6d

Note: Prices quoted for coal are approximate, pending settlement of code.



Prejudice and Custom Must Give Way to Scientific Study of Facts

By H. E. Stocker

AN ENDEAVOR should be made to get at the truth with respect to cargo handling and ship design uninfluenced by tradition and prejudice.

To obtain the truth with regard to cargo handling, the author has carried on studies of cargo handling in all its phases. Studies of organization and management have also been made because excellent methods and equipment are of little or no value unless they are used correctly by the organization. In some cases the character of the organization has acted as an effective bar to the use of new ideas on equipment and methods which would cut costs and expedite the movement of ships.

Striving for Improved Operation

It is surely of value to consider in what manner an organization may be modified to prevent a stiff-necked policy destructive to profits. It is profitable to consider organization and management so that we may be in a position to learn more about accelerating progress in organizations to keep pace with technical developments of naval architects, marine enginers, equipment manufacturers and terminal and mechanical engineers.

The author, H. E. Stocker, will present a paper on *Cargo Handling and Stowage* at the annual meeting of the Society of Naval Architecture and Marine Engineers in New York on Nov. 16. The article presented here is supplementary to the subject matter of this paper.

During the past five years many articles have appeared in this section covering the cargo handling features of ships and terminal design for better cargo handling.

In the studies referred to, consideration has been given to the basic economic principles of transportation, financing improvements in cargo handling methods, also management and organization, because experience in these studies has shown that because the problem of economical transportation has not been considered as a whole, costly mistakes have resulted. The author has found executives mislead as to the cost of handling cargo.

True cargo handling costs cover not only stevedoring labor, overhead and insurance, but capital charges on stevedoring equipment, also checking, labor and supervision costs of receiving and delivering cargo and the rental on capital or charges on the terminals. Subsidiary costs include fuel oil expended in driving a ship to make up time lost by lack of speedy handling of cargo.

A line may reduce costs by moving to a larger terminal but this must be balanced against the higher rental. An outsider may criticise the operation which results in congested terminal conditions but his criticisms will be unsound because this condition could be corrected only by moving to a larger terminal at a large increased rental.

Consideration must be given also to the effect of additional cargo upon the total cost of cargo handling and profits. Increasing cargo up to a certain point is profitable, but beyond that point it is necessary to acquire additional terminal space. The cost of the additional space must be considered in relation to revenue obtained for the additional cargo.

Sound Principles Must Prevail

Economic principles are not to be confused with theory; principles are just as much facts, as equipment and methods. Principles are a description of relationship of observed facts. They are based upon reliable information intelligently analyzed and interpreted.

A study of the facts concerning marine, railroad, roadway and airway transportation shows that profits depend to a large degree on the amount of time which the transporting unit is in movement. This is a principle of economical transportation. Lack of understanding of this principle has resulted in over emphasis of the amount of the freight rate when almost as much money was being wasted by utilizing more vessels than necessary for the transportation of the cargo, than would be gained by general advance of rates.

One of the simplest examples of improved efficiency of marine transportation obtained by increasing the size of the shipping unit is found

in the operation of the Fay Transportation Co., on San Francisco bay and the Sacramento river.

When two wheel hand trucks were used, approximately 13,000 cases of canned goods were unloaded in three days. Since the size of the shipping unit has been increased by placing the 60-70 cases of canned goods on skids at the sealer in the cannery and keeping the unit intact until delivery at destination, 11,000 cases are unloaded in about three hours. The space occupied by the skids reduces the cases handled each trip, but the increased speed with which the cases are handled decreases the terminal time, permitting more trips per year, and increasing the yearly carrying capacity of the barges. In addition, cargo handling costs and damage to cargo have been reduced, because the amount of handling has been reduced over 90 per cent. The average unit has been increased several hundred per cent, and the heavier load is carried at a faster speed with the aid of a gasoline lift truck. The hand truck used formerly picked up 5 to 18 cases in about five seconds, and dropped the load in about three seconds. The power truck picks up a heavy load—60 to 70 cases—in four seconds and drops it in the same time. The power truck handles approximately twenty times as much freight in one hour as a man using a hand truck.

Increased Carrying Capacity

The efficiency following the use of a heavier shipping unit also extends to the motor trucks which deliver the canned goods to the barge line terminal and to the transportation system with the cannery. The skids are loaded at the sealer, and then placed in storage with the aid of gasoline lift trucks until the time comes when they are sent to the terminal. They are then loaded on the motor trucks, six skid loads to a truck, making a total load of 360 to 450 cases. As with the barges, less cases are tranpsorted at one time, but the annual carrying capacity of the trucks is increased, because the terminal time is decreased

Every detail of the cargo handling and stowage particulars of a ship should be studied with the knowledge of all the basic principles of tranpsortation. That they are so often not so studied results in losses which could be avoided.

A ship, a terminal, and cargo handling equipment are tools for profits, to be expended as fuel oil is expended to achieve this objective. The only difference is that the ship is expended over twenty years and the fuel oil is expended over a few hours.

The ship concerned is modernized from time to time as it becomes obsolete in various particulars. Cargo may be increased by increasing the speed through fining the lines aft, fitting a new rudder and propeller and changing the ratio of the turbine gears; cargo handling may be speeded and costs reduced by replacing wooden hatch covers with steel or other hatch covers of modern design; all calculated to make the ship a more effective profit producing tool.

Terminals are modernized by installation of shipside elevators and cutting gangways for sideport operation and in minor details. However, once a terminal is constructed, there is little other than providing for sideport operation and construction of cargo masts which is ever done to make it a more efficient tool for production of profits.

Study Cargo Handling Method

The cargo handling method should be considered simultaneously with the design of the ship and also with the design of the terminal when this is possible. The method of handling cargo needs as much engineering study as does the design of the ship and the terminal to obtain the best possible results.

Recently a fine modern ship was designed and constructed. Many mistakes were made in the cargo handling features of the ship. At one end of the line, a make-shift cargo handling method was developed after the ship was constructed. At the other end of the line a modern cargo handling method was developed and certain structural changes made in the terminal so that cargo could be handled economically. This makeshift and unbalanced method was due to the lack of a properly trained and experienced co-ordinating executive. It is the function of the properly trained and experienced executives to design the cargo handling method from the time the cargo is received at port of origin until it is delivered at destination, utilizing whenever possible, methods and equipment which have proved successful elsewhere.

The profits made by alert concerns with their highly modern administrations and the research spirit which prevails within them, should alone be an incentive toward wider use of the scientific method in designing and managing shipping organizations.

Without the scientific point of view, and the aid of the scientific method, the shipping industry cannot achieve its rightful place in our economic life.

Most organizations are not designed with care, they cannot be so designed because of the complexities of the conditions that exist. Any ideally planned organization fails in practice due largely to the difficulties always inherent in anything involving human beings. This does not prove, however, that it is valueless to strive to attain more effective organizations by the utilization of the experience of others in many phases of human activity, as well as by courageous experimentation.

No amount of government aid will make up for lack of modern management methods in the next decade. We have passed the pioneering stage in our economic and political life and the point of view and the methods of management must be modified to meet these changed conditions.

Merchant Marine Academy

The New York State Merchant Marine academy held its graduation exercises at the Maritime exchange, 80 Broad street, New York City, Oct. 2 at 2:30 p.m.

Diplomas were awarded to 33 deck and engine room cadets for successfully completing the course given by the academy. The exercises were impressive in their simple dignity, and were attended by a group of well known shipping men in addition to the relatives and friends of the graduates.

The diplomas were presented by Robert W. Higbie, M.A., L.L.D., regent of the University of the State of New York. Licenses as officers of the merchant marine were presented by Dickerson N. Hoover, assistant director of the bureau of navigation and steamboat inspection. Addresses were made by Capt. J. H. Tomb, U.S.N. (retired), superintendent of the academy and Capt. Patrick F. Donnelly, retired marine superintendent of Isthmian line.

Webb Institute Degrees

The application of the trustees of the Webb institute of Naval Architecture for the right to confer upon its graduates the degree of bachelor of science in naval architecture and marine engineering was approved last spring by the University of the State of New York, and the members of the class of 1933 received their degrees at the commencement exercises on June 8.

This is a well deserved recognition of the high standing of the Institute and of the thorough training given its students.

Twin Screw Diesel Barge

The Electric Welding Co., East Boston, Mass., has under construction a 117-foot twin screw diesel barge. Electric welded construction is being used throughout. An unusual feature is the building of this barge on the deck of a large scow. The new vessel is to be equipped with twin screw diesel engines and will have a capacity of 150,000 gallons of oil. The vessel is being constructed for the Luzo Corp. of America, New Bedford, Mass.

New Ship Model Basin Proposed With Modern Facilities

A PROJECT for a new model basin has been presented by the United States navy department to the federal emergency administration of public works for authorization under the national recovery act.

It is proposed to construct a model basin at Cabin John, Md., in the immediate vicinity of the District of Columbia in order that it may be near the source of design of naval vessels and aircraft in the navy department. The particular site was selected on account of the possibility of securing foundations on bed rock and sufficient space for the purpose.

Included in the project are a large deep water basin for work with models of ships, a shallow basin for work with models of river vessels, a high speed basin for seaplane pontoons, etc., a turning basin for steering and turning tests, a general laboratory for testing ship structures, an aerodynamic laboratory with wind tunnels, and shops, power plant and an administration building. The three basins will be approximately 690 feet long by 50 feet wide by 22 feet deep; 200 feet long (300 feet with turning basin) by 50 feet wide by 10 feet deep; and 1600 feet long by 20 feet wide and by 10 feet deep, respectively. The carriages would be designed for maximum speeds of 12 and 30 knots, respectively.

This new model basin is one of the most important projects on the navy's program as presented under the national recovery act, and, in a sense, is self-liquidating. In scope it is a national project, and if we believe in a merchant marine, or in a navy, or in other words, if the United States believes in ships at all, this model basin is a necessity in order that this country may not fall behind European nations in facilities for investigating new characteristics of vessels, both naval and merchant.

Since the World war practically no new merchant general cargo vessels have been built. Within the next ten years a considerable program of merchant ship construction must be undertaken. It is, therefore, evident that it is of immediate importance to the shipping industry of this country to have adequate facilities for producing the most efficient new designs of ships.

The estimated cost of the new model basin is $3,200,000 which includes about 40 per cent for the cost of labor at the site, and the remaining $1,920,000, besides cost of the land, represents materials and equipment manufactured throughout the country. It meets ideally the requirements of the recovery act for providing wide-spread employment at a very early date.

All preliminary plans and designs have been prepared and contracts can be placed in the near future if the project receives the approval of the public works adminisration. Materials and equipment for its construction will be drawn from various localities throughout the country, thus distributing the benefit.

Naval Architects Meet in New York, Nov. 16-17

THE forty-first general meeting of the Society of Naval Architects and Marine Engineers will be held in the auditorium of the Engineering Societies building, 29 West Thirty-ninth street, New York City, Thursday and Friday, Nov. 16 and 17. Twelve papers are scheduled for presentation at the professional sessions, which will begin each day promptly at 9:30 a.m. The council of the society will meet at 3 p.m., Wednesday, Nov. 15 in the board room on the fifteenth floor of the Engineering Societies building.

On Saturday, Nov. 18, at 7:30 p.m., a dinner-dance will be held on the new United States liner, WASHINGTON, at Pier 61, North river. All those desiring to inspect the ship will be given this opportunity during the evening. Reservations are to be forwarded to the office of the secretary of the society. The cost of the entire evening's entertainment is $2.50 per person.

The annual banquet will be held in the grand ballroom of the Commodore hotel, Forty-second street and Lexington avenue, New York City, on Friday evening, Nov. 17, promptly at 7:30 o'clock. Immediately preceding the banquet there will be a reception beginning at 7:00 o'clock. Tickets for the annual banquet on Friday evening are $5.00 each for members. Each member may invite one non-member guest for whom tickets will be $10.00 each. Reservations accompanied by check should be mailed to the secretary of the society on or before Nov. 10.

Titles of the twelve papers, names of authors and the order in which the papers are to be delivered follows:

Thursday, Nov. 16, 9:30 a.m.

1. *Theory of Elasticity, Solution of Problems by Trial*, by L. W. Ferris, visitor.
2. *Some Notes on Defects and Fractures*, by William Bennett, member.
3. *Fire Control for Passenger Vessels*, by George G. Sharp, member.

Thursday, Nov. 16, 2:00 p.m.

4. *Effect of Form on Roll*, by Lieut. M. E. Serat, (CC) U.S.N., visitor.
5. *A Method for Estimating Ship Frictional Coefficients*, by Rear Admiral David W. Taylor (CC) U.S.N., (retired), past president.
6. *Cargo Handling and Stowage*, by H. E. Stocker, associate member.

Friday, Nov. 17, 9:30 a.m.

7. *Diesel versus Steam Drive for Cargo Ships*, by Louis R. Ford, member.
8. *Full Scale Trials on a Destroyer*, by Commander H. E. Saunders (CC) U.S.N., council member, and Lieut. Commander A. S. Pitre, (CC) U.S.N., visitor.
9. *Notes on S. S.* MANHATTAN, *with Some General Comment on North Atlantic Liners*, by Ernest H. Rigg, vice president.

Friday, Nov. 17, 2:00 p.m.

10. *Launching of the* NORMANDIE, by A. See, member.
11. *Water Circulation and Gas Path in Naval Boilers* by Rear Admiral Samuel M. Robinson, U.S.N. vice president.
12. *Water Conditioning and Related Problems of Marine Boiler Operation*, by Dr. A. C. Purdy, member.

Useful Hints on Cargo Handling

INSULATED hatch covers of the Mancanking type are made in three thwartship sections to suit usual practice. The sections are built of steel plates with athwartship stiffeners and are insulated on the under side in a manner similar to the deck. Brine grids are permanently housed on the under side of the cover sections. The cover sections, with brine grids attached, are rolled off in a fore and aft direction by means of wheels fitted with eccentric bushings. A one-half turn of the bushings with a marlinspike raises the cover about an inch from the watertight packing. The covers are arranged so that any one section may be left open by rolling the cover off this section.

A number of advantages of this type of hatch cover are evident. It is easier to open and close the hatch than in the case of the ordinary wooden hatch covers. When the hatch is open the deck at side of hatch is kept clear. The brine grids are less likely to be damaged. Efficiency of refrigeration is improved. It is also said that the capital cost compares favorably with the usual wooden hatch, tarpaulin and wood plug system.

Getting the Right Man

IT IS easy to write the specifications required for a man filling an executive position; it is difficult to find the man to fit the specifications. We can specify steel of certain physical and chemical characteristics and get it, but we cannot specify a man with certain characteristics of mind and temperment and get it with the same degree of accuracy. It is this unstable factor which complicates the problem of management and in the stabilization of which lies the greatest opportunity for success. There is much in managment progress to warrant far beter results than at present obtained.

In handling newsprint paper at the Matson Terminals, Seattle, two rolls weighing 1400 pounds each are lifted on one slingboard. The rolls are lowered singly into the holds with a sling rope reinforced with convas. This method has been found satisfactory and reduces the possibility of damage to a minimum. Steel rails are lifted by trucks and placed on three trailers, tandemwise and then hauled to ship side by tractors.

THIS page is being devoted to short items on all matters having to do with the more efficient turnaround of ships. These items are intended to be of a helpful nature.

We will welcome for this page brief descriptions, illustrated if possible, of any better or safer way of performing any function in cargo handling. Also, any questions submitted will be answered by the editor.

Efficient Sling Boards

CONTINUOUS use of sling boards is a feature of operation at the Matson Terminals, Seattle. A special wood board for this purpose was designed by W. D. Gould, manager of the terminal. Hundreds of these boards are available at all times. They are made of Douglas fir and measure 60 by 72 inches. The top layer consists of five 2 by 8 inches planks with open spaces between. The cross sections are pieces of timber 3 by 4 inches in size, while the lower boards are 1 by 8 inches.

The sling is strongly braced and is held together by both nails and bolts. The top boards overlap 6 inches at both ends under which the bridle is slipped when the load is being raised or lowered by ship's gear. The wide boards on the bottom perform the important functions, not only of bracing the entire sling but also in acting as dunnage, so that each load can be piled upon the one below. These board slings are inexpensive, have long life and serve efficienctly in saving time and handling.

Slingboards Used for Sacked Cargo at Matson Line Terminals, Seattle

The accompanying illustration shows a rebuilt mill truck at the Matson Terminals, Seattle carrying five 2-ton unit loads, each on a slingboard of the type described.

Light Painted Holds

THE Black Diamond Steamship Co. uses aluminum paint for holds of its ships. The result is satisfactory from every point of view. The cost is no greater, the holds are lighter and the paint wears better than that formerly used.

The engine rooms are also painted with aluminum paint with the exception of steam surfaces such as turbine casings. These are covered with a mixture of graphite and oil. An unusually neat appearance results from this practice.

Apples, if fresh or dried, carried in barrels or cases, should be stowed in a dry, cool, well ventilated place, and barrels should be handled so as to relieve any undue pressure on the fruit. Barrels are, as a rule, perforated so as to assist in ventilation.

The standard for tubular steel cargo booms have been published by the American marine standards committee, together with standards for boom fittings. In testing booms, it is recommended that a weight one and a half times the working load be hoisted while the boom is at its lowest working position.

Good Personnel Relations

NO SYSTEM of management should be applied in a wooden manner. The proper personnel relations are vital to profits and that necessitates treating men as human beings.

Rockne's fame in football was not based upon training individual players, but in creating a team.

In military affairs great achievements have also been accomplished by those who develop team work.

In those business organizations, that function as a team, greater results are accomplished. One man organizations do not get results.

Opinions are worthwhile only when facts are lacking. In cargo handling the problem is not lack of facts as to how to handle cargo economically, but rather a lack of fact utilization.

Col. Markham Appointed Chief of Engineers

By his appointment of Col. Edward M. Markham as chief of engineers, with the rank of major general, President Roosevelt has placed the government's $125,000,000 federal public works program in able hands. His selection for this highly responsible post at this critical time will receive universal approval. An energetic and intelligent prosecution of the projects to be undertaken may be expected.

For the last four years, since Oct. 26, 1929, Colonel Markham has been division engineer for the Great Lakes with headquarters at Cleveland. His appointment as chief of engineers was officially announced Oct. 17, and he will at once take up his new duties succeeding Major General Lytle Brown whose term as chief of engineers ended on Sept. 30.

The new chief of engineers has had wide experience in charge of engineering work since he began his service as second lieutenant after graduating from West Point in 1899, standing fifth in his class.

On request from Washington, General Markham, who had gone to Detroit in connection with the opening of bids on the huge harbor development at Toledo, O., on Oct. 18 took the oath as chief of engineers in the office of Major R. C. Crawford, district engineer. While in Detroit, General Markham also attended the conference of the Great Lakes Harbor association and on Oct. 19 made an address before the conference.

He has been prominently identified with the engineering studies of the St. Lawrence waterway and in 1930 by appointment of ex-President Hoover he was one of three army engineers who in association with engineers representing the Canadian government came to an agreement on certain engineering features in connection with the construction of the proposed waterway.

General Markham was born in Troy, N. Y., July 6, 1877. He was appointed to the United States Military Academy from New York and entered June 15, 1895. On graduation Feb. 15, 1899 he was appointed assistant to the United States district engineer, St. Augustine, Fla., with rank of second lieutenant. This was followed by service in the Philippines and in Cuba. In July, 1907 he was appointed assistant engineer commissioner at Washington, D. C. From 1912 to 1916 he was district engineer in charge at Memphis, Tenn.; followed by one year as professor of military engineering at the United States Military academy, West Point, N. Y.

In August, 1917 he organized and commanded the 303d regiment of engineers, Camp Dix, N. J., until relieved of command in France, August, 1918. He was then assigned to general headquarters of the American expeditionary forces as deputy director of light, railways and roads, in which capacity he continued until December, 1918. He then served in Coblenz, Germany as chief engineer of the army of occupation. From March, 1919 to June, 1925 he was district engineer at Detroit. From June, 1925 to October, 1929 he was commandant of the post and of the engineers school at Fort Humphreys, Va. Then followed his service as division engineer of the Great Lakes.

His elevation to the highest post in the engineering branch of the army, it is believed, is based on his record during his six years as district engineer at Detroit and his last four

Maj. Gen. Edward M. Markham
Appointed Chief of Engineers, United States Army,

years as engineer in charge of the entire Great Lakes division. Since from his record it is clear that he considers the St. Lawrence waterway an entirely feasible and practical project his appointment is looked upon as an indication that the President will back ratification of the St Lawrence waterway treaty when congress meets.

The Eastern Steamship Lines Inc. recently announced the appointment of Albert J. McLaughlin of Newton Centre, Mass., as controller to succeed Alton B. Sharp who has been elected president. Mr. McLaughlin has been assistant controller of the Eastern Steamship lines for four years.

He was born in Brooklyn, N. Y., 38 years ago, and after high school, took a course in the school of business administration, Columbia university. During the World war he served in the air corps and was discharged at the close of hostilities with the rank of first lieutenant.

Annual Safety Congress Meets in Chicago

The twenty-second annual safety congress sponsored by the National Safety council was held in Chicago, Oct. 2 to 6. The strictly marine sessions were held on Oct. 3 and 4. The attendance was exceptionally good. At least 50 members were present.

Frank H. Cogan as general chairman opened the marine sessions at 9:45 a.m. Oct. 3. He presented his report on the year's activities and accomplishments. His report brought out an unusual amount of discussion.

Capt. David W. Todd, U.S.N. (retired), United States shipping board bureau, presented a paper on the relation of the United States shipping board bureau to marine safety, and covered the progress of the work in reducing the catastrophe hazards of the sea. His theme was, "Save the ship and you save the lives on board." The discussion which followed brought out the importance of radio, radio direction finders, the gyro-compass and other modern aids to navigation. The meeting adopted a resolution urging the early ratification by the United States of the safety of life at sea convention.

C. P. Waite of the Travelers presented a paper on analyzing statistics to promote safety. A long discussion followed in which representatives of the stevedoring branch of the industry were most prominent.

The marine session on Oct. 4 began by the presentation of a paper by Capt. E. W. Fiske Jr., port captain of the Standard Vacuum Transportation Co., New York, on his company's experience in organizing a fleet for safety and the results that might be anticipated. The question whether ship safety committees are practical or not came up, and it was Captain Fiske's experience that the suggestions made by such committees are generally constructive and are valuable to the shore staff. Others in attendance confirmed this by their own experiences.

A paper on what the West coast is doing for the safety of marine workers, prepared by Henry Blackstone, safety engineer, U. S. P. & I. Agency Inc., San Francisco, was presented by Capt. E. C. Holden Jr. of New York, who before reading the paper discussed what New York is doing along the same line. This paper summarized the organization, methods, and results of the accident prevention bureau of the Pacific American Steamship Owners and co-operating associations.

Capt. Frank H. Cogan will continue as general chairman for another year. Mr. Ames was elected to represent the Gulf ports. Capt. Elliott Vandevanter, corps of engineers, U.S.A., was elected to the board representing the membership of the United States engineers.

Up and Down the Great Lakes

Heavy Freight Movement—Large Volume of Ore and Coal—Lake Levels—Traffic Through St. Lawrence

FREIGHT passing through the Sault Ste. Marie canals during September, amounting to 8,453,292 tons, was the greatest tonnage since October, 1930, and was more than twice the tonnage for September, 1932. Ore, which amounted to 5,591,807 tons as against 688,205 tons last year, accounted for practically all of this increase. Hard and soft coal both showed increases but wheat was lighter by 11,133,680 bushels or 25 per cent than in 1932. Other grains also fell off from 4,550,611 bushels in 1932 to 2,662,493 bushels. The total traffic for 1933 to the end of September amounted to 29,962,733 tons as compared with 13,464,885 tons for the same period in 1932.

September showed the heaviest traffic through the Welland ship canal in its history, amounting to 1,373,242 tons. This was 81,039 tons in excess of last year's tonnage for the same month. Wheat, flaxseed, rye, oats, and barley were lighter than in 1932, but flour increased by 19,914 tons; cement, brick and lime by 15,635 tons; iron, pig and bloom by 2278 tons; iron and steel, 8434 tons; iron ore by 19,594 tons; coke, by 38,914 tons; and merchandise by 46,843 tons. From the opening of navigation to the end of September, 6,641,935 tons freight used the canals against 6,052,344 tons for the same period in 1932.

Total freight using the St. Lawrence canals during September amounted to 1,129,076 tons, which was the heaviest September traffic since 1928. Wheat was lighter than in 1932 by 25,400 tons, oats by 29,023 tons, and barley by 16,958 tons, but flour increased by 10,479 tons, gasoline by 10,085 tons, ore by 25,316 tons, sand by 6457 tons and merchandise by 56,695 tons. There were 5946 tons of iron ore, 2100 tons of copper ore and 10,204 tons of other ore, mostly manganese, carried up the canals during the month as against only 18 tons in 1932. For the year 1933 up to Sept. 30, the total traffic amounted to 5,129,798 tons as against 4,877,635 tons in the same period last year.

Closing of Barge Canal

Clearances on the Erie canal from either Buffalo or Waterford will not be issued after midnight Nov. 25 for wooden boats and after midnight Nov. 30 for metal boats.

No clearnaces on the Champlain canal will be issued after midnight Nov. 30. Clearances on the Oswego canal will not be issued after midnight Dec. 3.

Work of removing buoys and channel markers from the Cayuga and Seneca canal will begin on Nov. 15.

September Lake Levels

The United States Lake survey reports the following monthly mean stages of the Great Lakes for the month of September, 1933, determined from daily readings of staff gages.

Lakes	Feet above mean sea level
Superior	602.84
Michigan-Huron	578.21
St. Clair	573.96
Erie	571.06
Ontario	244.37

Lake Superior was 0.01 foot lower than in August and it was 0.07 foot below the September stage of a year ago.

Lakes Michigan-Huron were 0.34 foot lower than in August and they were 0.08 foot below the September stage of a year ago.

Lake Erie was 0.41 foot lower than in August and it was 0.14 foot below the September stage of a year ago.

Lake Ontario was 0.39 foot lower than in August and it was 0.67 foot below the September stage of a year ago, 1.18 feet below the average stage of September of the last ten years.

Coal Movement Heavy

Coal shipments from Lake Erie ports between the middle of September and the middle of October averaged slightly over 960,000 tons per week. The total movement for the present season up to Oct. 16 amounted to 25,195,582 tons as compared with 18,156,378 tons for the corresponding period of 1932. This was for cargo coal.

In addition to the cargo coal, vessels continued to move greater quantities of bunker coal. The total for this season up to Oct. 16 was 797,470 tons compared with 451,827 tons for the corresponding period of 1932.

The total coal movement, cargo and bunker, for the season 1933 to Oct. 16 was 25,993,052 tons compared with 18,608,205 tons for the corresponding period 1932 and 26,241,216 tons for the same period in the season of 1931. From these figures it will be noted that while the movement of bituminous coal on the lakes this year is far in excess of last year, it is still slightly under the movement in the same period of 1931. Present information indicates, however, that before the present season is over, and that will be all through the month of November the total coal movement for this year will reach 27½ million to 28 million tons somewhat in excess of the year 1931.

Ore Shipments Continue

During September, shipments of iron ore from upper lake ports amounted to 5,504,175 tons, as compared with 641,228 tons for the month of September, 1932. Up to Oct. 1, 1933 a total of 16,299,573 tons of ore had been shipped from upper lake ports, compared with 2,391,155 tons up to Oct. 1 a year ago. Balance of ore on dock at Lake Erie ports on Oct. 1, 1933 amounted to 5,033,573 tons compared with 5,241,016 tons Oct. 1, 1932.

From these figures it will be noted that the rate of increase in ore movement this year compared with last year is even greater for the month of September than it was for the month of August. The increased movement in September this year, compared with September last year, amounted to 4,862,947 tons. Up to Oct. 1 this year 13,908,418 tons more of ore had been moved than in the same period last year. It is now believed that the rate of increase will drop off somewhat for the remainder of the season. Even taking this into account, the season should end with a total movement of at least 20,000,000 tons and possibly somewhat more. As this is written, a number of vessels are being taken off the ore carying trade. However, there seem to be enough definite commitments to make up the total anticipated before the end of the season.

World Shipbuilding Totals Show Slight Increase

THE long continued decline of world production of merchant vessels of 100 tons gross and upwards has been checked according to a statement recently issued by Lloyd's Register of Shipping, for the quarter ended Sept. 30 last.

The aggregate gain in world output over the quarter ending June 30 last, was 24,000 gross tons, or about three per cent in excess of the June 30 total of 732,495 gross tons.

For the United States there was a gain of 11,000 gross tons, as compared with an advance of 16,000 tons for Great Britain and Ireland, 9000 tons for Holland, 4000 for Denmark, and about 3000 tons each for France and Japan. For Germany there was a decline of 19,000 tons, as against losses of 7000 tons for Sweden, and about 1500 tons for Spain.

The United States, which at the end of June was building less than one half of one per cent of the world's merchant shipping production, now has about two per cent of the world output in hand, while the proportion for Great Britain and Ireland is slightly over forty per cent.

A comparison of the volume of ship production during the last two quarters in figures representing gross tons of merchant vessels follows:

	Sept. 30, '33	June 30, '33
Great Britain and Ireland	303,762	287,502
United States	14,654	3,038
Other countries	438,336	441,955
World total	756,752	732,495

Over 90 per cent of the construction in Great Britain and Ireland is being supervised by Lloyd's, and about 70 per cent of the entire world output.

It is noted, however, that during the last quarter orders on which construction was begun aggregated 23,000 gross tons less than the volume of tonnage launched during the period. In the previous quarter, the volume of new work was 42,000 tons greater than the total launched.

Comparison of new work and launchings in the last two quarters, is shown in the following table of gross tonnage:

New Work

	Sept. 30, '33	June 30, '33
Great Britain & Ireland	38,802	50,050
Other countries	67,817	70,145
World total	106,619	120,195

Launchings

	Sept. 30, '33	June 30, '33
Great Britain and Ireland	41,433	10,093
Other countries	88,548	67,462
World total	129,981	77,555

Tanker construction continued to decline during the quarter just ended, the total for steam and motor vessels of this type, each of 1000 gross tons or upwards, showing a decrease of 11,000 gross tons from the figure for the June quarter. This was due to a drop of 50 per cent in Germany's output of this class of vessel. The total tanker production for the last two quarters is shown in the following table, of gross tonnage:

	Sept. 30, '33	June 30, '33
Sweden	47,600	47,600
Great Britain and Ireland	31,026	30,026
Italy	21,726	21,726
Spain	18,212	18,212
Germany	12,400	24,800
Other countries	18,100	18,100
World total	149,064	160,464

The bulk of the tanker tonnage under way is comprised of motorships, these representing 131,304 gross tons of the world total of 149,064 tons.

For motorships of all classes a slight reduction in the volume of tonnage under way was shown during the quarter just ended, while all other types of vessels combined showed a gain of 25,000 gross tons in the same period. Motor vessel production, however, continues to be in excess of the aggregate for all other classes of merchant ships. The September quarter was the first quarter this year that motor tonnage has failed to show an increase over the preceding quarter. A comparison for the last two quarters is given in the following table of gross tonnage:

	Sept. 30, '33	June 30, '33
Motor vessels	414,095	414,997
Other types	342,657	317,498
World total	756,752	732,495

As in the June quarter, motor vessels represent about 28 per cent of the total shipbuilding program for Great Britain and Ireland. During the September quarter, however, the other maritme countries, taken as a group, showed a reduction in their motorship construction, the proportion falling from 75 per cent to 72 per cent. The following table shows the comparison in construction by these countries during the quarter just ended, in gross tons:

	Great Britain & Ireland	Other Countries
Motor vessels	87,294	326,801
Other types	216,468	126,189
Total	303,762	452,990

Great Britain and Ireland, however, still lead all countries in the volume of their motorship building, and Japan ranks next, having displaced Sweden during the September quarter, Japanese production increasing during that period, while Sweden's declined. Holland also made a gain, as did Denmark; but Germany's construction of motorships showed a sharp decrease. Motorship building during the past two quarters is given in the following table in gross tons:

	Sept. 30, '33	June 30, '33
Great Britain and Ireland	87,294	81,118
Japan	77,470	74,180
Sweden	69,900	76,860
Holland	40,427	31,288
Germany	28,500	46,850
Spain	28,052	29,652
Italy	27,076	27,076
Denmark	26,150	19,283
United States	653	503

For the September quarter advances were shown in the aggregate power of oil engines and steam turbines in hand, while there was a decline for steam reciprocating engines.

For oil engines, taking in all countries handling these, the aggregate horsepower increased from 432,990 at the end of the June quarter to 494,1922 at the end of September. The latter figure includes 72,939 indicated horsepower for Great Britain and Ireland, 70,072 for Germany, 96,885 for Holland, 83,990 for Japan, 55,470 for Sweden, 27,350 for Denmark and 5726 for the United States.

During the same period the aggregate shaft horsepower of steam turbines advanced from 355,877 to 423,073 of which latter total, 229,470 was for Great Britain and Ireland, and 172,000 for France.

For steam reciprocating engines the world aggregate showed a decline from 104,393 in the June quarter to 98,883 in the September quarter. For Great Britain and Ireland the September total was 74,698.

The relative ranking of the various ship building countries there was no change in the status of the four countries that led at the end of the June quarter, Great Britain and Ireland, France, Japan and Sweden, standing first to four in the order named. Germany fell from fifth place to eigth, while Italy and the United States retain their places in ninth and tenth positions, respectively. Tonnage under way in the several countries in the last two quarters is given in the following table of gross tonnage:

	Sept. 30, '32	June 30, '32
Great Britain and Ireland	303,762	287,502
France	95,838	92,406
Japan	85,570	82,280
Sweden	71,440	78,832
Holland	40,862	31,723
Denmark	31,970	27,183
Spain	31,924	33,512
Germany	30,300	49,855
Italy	27,076	27,076
United States	14,654	3,038

As in the June quarter, only two vessels of 20,000 gross tons or over are now being built in the world, one for Great Britain and Ireland and the other for France.

Personal Sketches of Marine Men

Capt. Frank T. Cable, Consulting Engineer, Electric Boat Co.

By A. H. Jansson

HE HAS had a career without parallel, having been closely associated with building and operating submarines from the earliest days.

COMMANDING the submarine Holland, he demonstrated her usefulness as a war vessel with such success that the government bought her.

ENGLAND, Russia, Japan, Holland and Austria called on him to supervise the construction of their first submarines and to train their crews.

IN HIS 35 years of experience with the submarine, 15 of these years practically spent under water, Capt. Frank T. Cable, now just over 70 years of age and consulting engineer for the Electric Boat Co., Groton, Conn., never lost a life or had any man seriously injured. He was associated with the inventor of the submarine, John P. Holland, for a number of years in the early days. In 1900, while in command of the submarine HOLLAND (see story elsewhere in this issue) Captain Cable gave an exhibition on the Potomac river for Admiral Dewey and his staff.

Shortly afterward the United States government purchased the HOLLAND and she became the first submarine of the navy. The HOLLAND was built at the Elizabethport, N. J., shipyard of Lewis Nixon. When the Electric Boat Co. was formed, largely through the initiative of Captain Cable, he became affiliated with this organization as superintendent of construction and operation. He has built and operated submarines in most of the leading countries of the world. The first submarine for England was built under his direction in 1902. He also trained the British crews. He had charge of building the first submarines for Russia, Japan, Holland and Austria.

It is difficult now to realize the hardships in navigating submarines in the early days. Until 1902, five years after the first trial run of the HOLLAND, when the periscope was first brought into use, the submarine had to be navigated almost entirely by dead reckoning. The 2½-inch magnetic compass, set within 10 inches of the steel hull and heavily compensated, was so sluggish that it was more or less a snare and a delusion.

Had they fully realized the dangers in those early days of pioneering there might not be a submarine today. Compare the HOLLAND of 74 tons displacement with the CUTTLEFISH of 1130 tons which his company has contracted to complete by Dec. 31 of this year, 2½ years after the start of construction.

As he withdraws from the active scene, that limited but highly skilled group of artisans in all seafaring nations the world over who design and fashion vessels of war and peace will recognize in him a true exponent of the American genius for practical accomplishment along mechanical lines. Nothing daunted him.

Frank Taylor Cable was born at New Milford, Conn., June 15, 1863, the son of Abijah and Olive (Taylor) Cable. His father was a native of Connecticut and his mother of New York state. His early years were spent on his father's farm. He was educated in the public schools and attended Claverick college, Hudson, N. Y., for one year.

When he was 25 years of age he went to work at the Gas Engine & Power Co. at Morris Heights, N. Y., as a mechanic and remained there for about two years. He then joined the Electro-Dynamic Co. in Philadelphia as an electrical engineer where he stayed 8 years. In 1898 he was called to the shipyards of John P. Holland to assist the latter in some problems in connection with the building of a submarine boat, with the result that he was offered a permanent position. At first skeptical of the possibilities of the submarine, he soon became certain that it would be successful, and through his influence the original Holland company was reorganized in 1900 by Isaac L. Rice who later became president of the new company known as the Electric Boat Co.

About this time Captain Cable was supervising the building of the FULTON, an advanced type of submarine, which was later sold to Russia to be used against the Japanese. He visited St. Petersburg for the purpose of training a crew, then went to Tokio to assist the Japanese in organizing a submarine campaign. During the Russian-Japanese war he had the experience of being followed across two oceans by spies.

For 18 years Captain Cable was vice president and general manager of the New London Ship & Engine Co. In 1929 the Electric Boat Co. took over this business.

Captain Cable married Miss Nettie A. Hungerford, of Sherman, Conn., May 30, 1892. Their home is in New London. A summer home is also maintained at Milford, Conn., the town of his birth.

The European Diesel

(*Continued from Page* 14)

LECTRO appears to offer the possibility of the diesel being taken up on a large scale by the British towing world. In the ocean going tug ZWARTE ZEE the Dutch preferred two reasonable sized diesels mechanically geared to a single shaft to electric transmission.

It is known that when Lord Kylsant was considering the 1000 foot OCEANIC for the White Star line's transatlantic service he was definitely in favor of diesel electric machinery with a considerable number of generating units. But her construction is held up indefinitely and the White Star line is under different control so that the future of the scheme is, to say the least very obscure. On the Eastern and Australian services the P & O line has definitely shown itself to be in favor of turbine electric rather than diesel electric drive.

In the motor coaster field the British engineers did the pioneer work but after a short time were held up by the war and most of the credit for the remarkable progress made goes to the German and Dutch engineers and shipbuilders who evolved a new and efficient type of vessel which not only captured a big share of the North Sea trade but also of the purely coasting trade of the British isles. It is interesting to note that within the last two years British engineers have more than made up this leeway and a big fleet of motor driven coasting craft is being added to the red ensign. The vessels in this fleet range from large numbers of small shallow draft craft able to nose their way into innumerable little ports to the BRITISH COAST of 1400 tons which is now being built for the regular services of the Coast Lines Ltd.

Some Important Installations

Perhaps the best means of showing the progress made by the diesel engine during the last two years is to mention some of the most important ships fitted with this type of machinery. These include practically all the really important ships built to any novel design. Among passenger ships the White Star GEORGIC has been particularly successful as a money maker on the Western ocean and the Italian cabin motorships of the NEPTUNIA class scarcely less successful on the South American run, driven by Sulzer two-cycle single acting engines. Among the fast cargo liners, and it is interesting to note that all the favorites in the "Australian Wool Derby" are motor driven, are some fine ships with a trial speed up to 18 knots and over. Conspicuous in this group are the Westfal-Larsen motorships of the BERDANGER class, single screw, with double acting two-cycle airless injection engines of the Stork-A.E.G.-Hesselman type whose makers successfully guaranteed that their fuel consumption should not exceed 0.35 pounds per brake horsepower per hour for the main engine driving its own scavenging pump.

But the most interesting ship on the mercantile side is undoubtedly the PRINCE BAUDOUIN, a cross channel packet built by the Cockerill yard for the Belgian government's mail service between Ostend and Dover. She is the fastest motor merchantman, with a speed of 24 knots, and although the VENUS and VICTORIA had proved that the diesel was safe for speeds generally regarded as far beyond its reach it was a daring experiment on the part of the Belgians. The engines are twin screw Sulzers developing 17,000 brake horsepower at 268 revolutions per minute, direct coupled to the shafts.

The difficulties to be overcome in fitting diesel engines in such a ship were the low head room and the necessary accessibility for overhauling during short stays in port. The double acting principle seemed to be the obvious one but after careful consideration this was rejected. It is true that in the single acting unit the weight per brake horsepower was 52 pounds against 49 pounds for the double acting, but allowance had to be made for the extra weight for cooling water and oil, and various other extras which are regarded as being necessary for reliable running. She is not yet in service but the bench tests of her engines showed a consumption of 0.38 pounds per brake horsepower per hour with airless and 0.42 pounds with air injection.

On the naval side also progress has been made. In the Colonial sloops which would have to be regarded as cruisers had France been a signatory to the London disarmament treaty, the French navy has installed diesel engines with success, giving them a large radius of action, avoiding the trouble of boiler-room heat in a tropical climate and contriving trial speeds up to 19 knots against the 15½ knots for which they were designed. In the British navy, four-stroke cycle, single acting, pressure charged, Vickers Armstrong diesels gave a speed to the new submarine THAMES, which had until then been regarded as only possible with a turbine installation with all its attendant disadvantages in a submarine.

But it is in the German navy that the greatest progress has been made, the engineers being spurred on by the necessity of getting the last ounce out of every ton to which they were limited by the naval clauses of the treaty of Versailles. Diesel engines for cruising purposes, in steam driven ships, were considered before the war, but they have been made practical in cruisers of the LIEPZIG type and led to the idea of saving weight by using diesels for all propulsive purposes. The gunnery tender BREMSE was fitted with eight 8-cylinder diesels of 3650 brake horsepower each at 600 revolutions a minute, geared to the shafts, and was designed for a speed of 27 knots which is the highest designed speed for any motor driven ship. Her successful trials came as a pleasant surprise for the marine engineering world.

But the tender only led up to the much discussed "pocket battleship" DEUTSCHLAND which has passed her tests triumphantly and which is the first unit of a class of four. Strictly limited to 10,000 tons by the treaty of Versailles, weight has been reduced everywhere, conspicuously in the hull by the use of electric welding etc. but more conspicuously still in the engine room for unprecedented lightness has been attained by methods which are too expensive for merchantmen.

She is a twin screw ship with four double acting two-stroke cycle, M. A. N. diesels, airless injection, with nine cylinders per engine, geared to each shaft, the total designed horsepower being 50,000 for 26 knots, which she is understood to have exceeded by three knots on trial, while her radius of action is no less than 10,000 sea miles at 20 knots.

The completion of the BREMSE and the DEUTSCHLAND has given the diesel engine an entirely new status for naval work.

Torpedo Boat Holland

(*Continued from Page* 11)

Only a very slight shock occurred to the boat when the torpedo was fired. The captain gave orders to the engineer by the ordinary method of bells and to the torpedo men and pump men by word of mouth. When submerged the boat was kept at a chosen depth without any difficulty by the means of the horizontal rudder. The evenness of the immersion was well shown by the depth gages, but must have been apparent from the other vessels from the positions of the flags. It is worthy of note from first immersion the water as seen through the deadlights was entirely opaque and at the maximum depth it looked almost black. During the nearly three hours we were in the boat the air was perfectly pure."

The result of this exhibition is a matter of history. The navy department and nearly all navy officers were enemies of the submarine, yet in face of this opposition the United States government purchased the HOLLAND and she became the first submarine boat in the United States navy. She was used for several years for training purposes, and later was sold for scrapping.

A patriotic citizen of New York purchased her from the junk man and presented her to a museum in Bronx park. At this writing she is lying in Starlight park, One hundred seventy-seventh street, New York City a monument to the life work of John P. Holland.

Marine Review

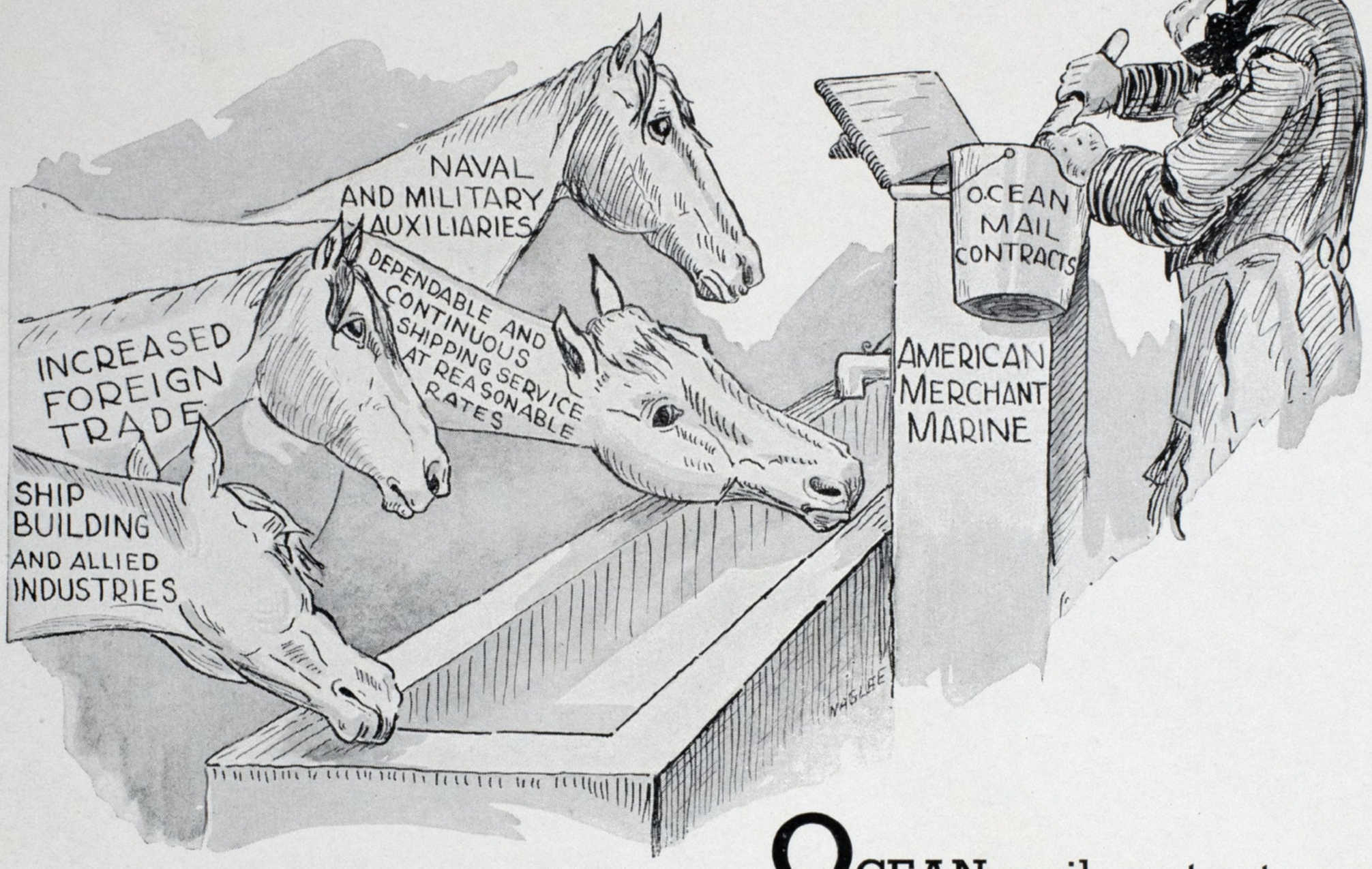
Reg. U.S. Pat. Off.

The National Publication Covering the Business of Transportation by Water

Looking Forward, S. S. Mariposa

November, 1933

PRIME THE PUMP
AND
SAVE THE STOCK



OCEAN mail contracts were not intended for the physical carriage of mail only but were designed to place the American ship on a footing of economic equality with its foreign competitor. Practically every other maritime nation of commercial importance has been carrying out a similar policy for many years. The Act of Congress authorizing such contracts clearly defines the purpose.

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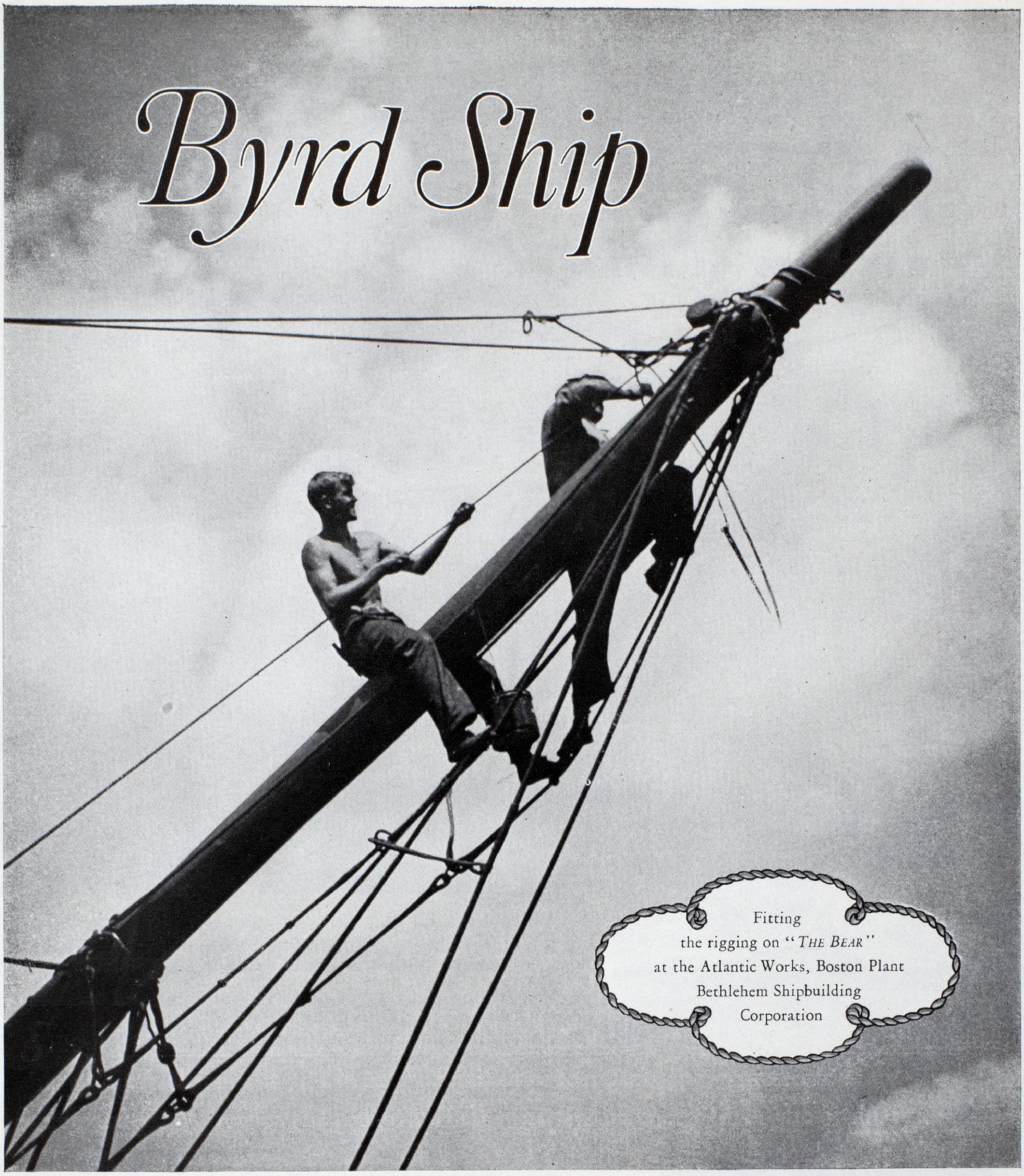
Byrd Ship



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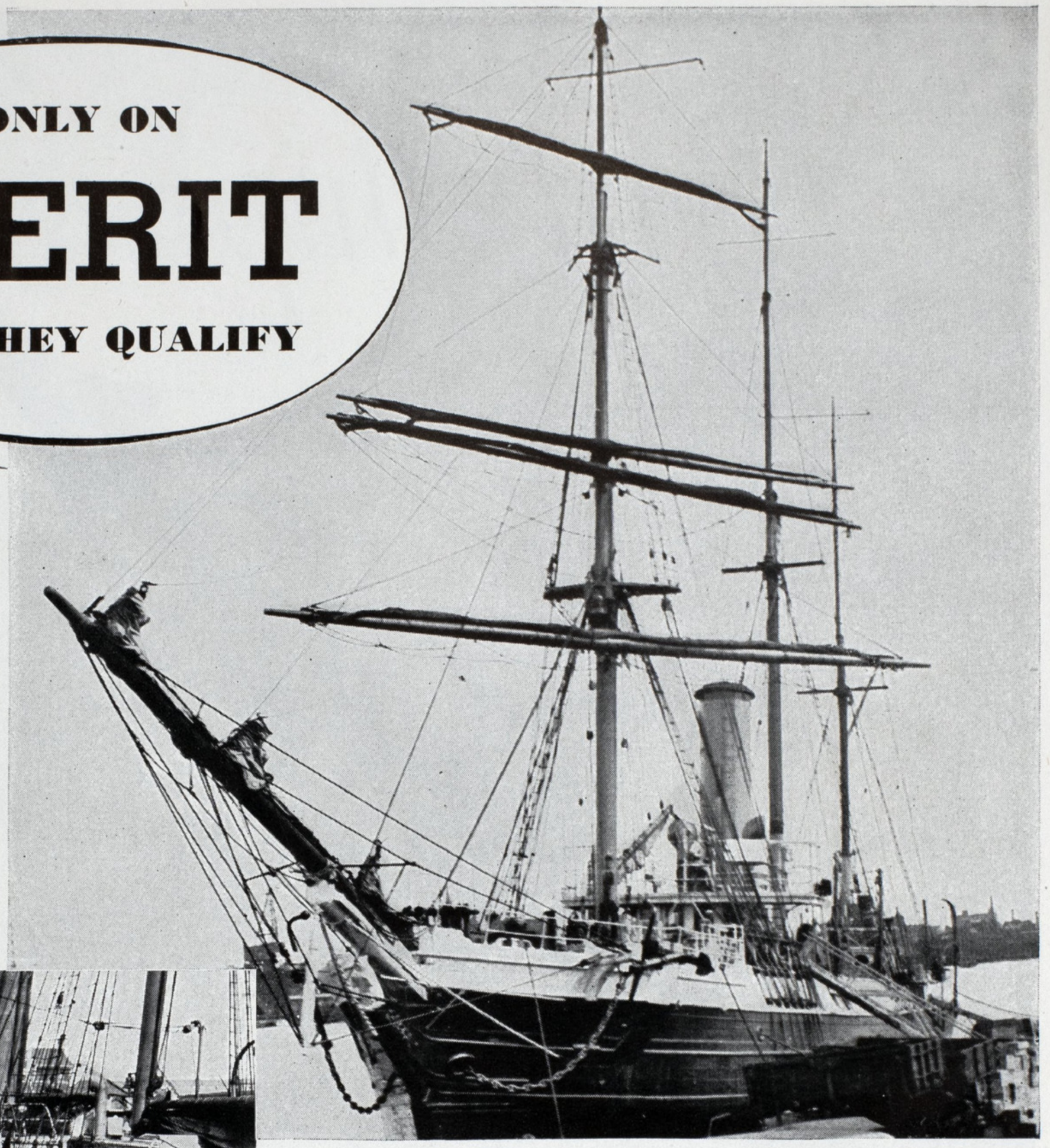

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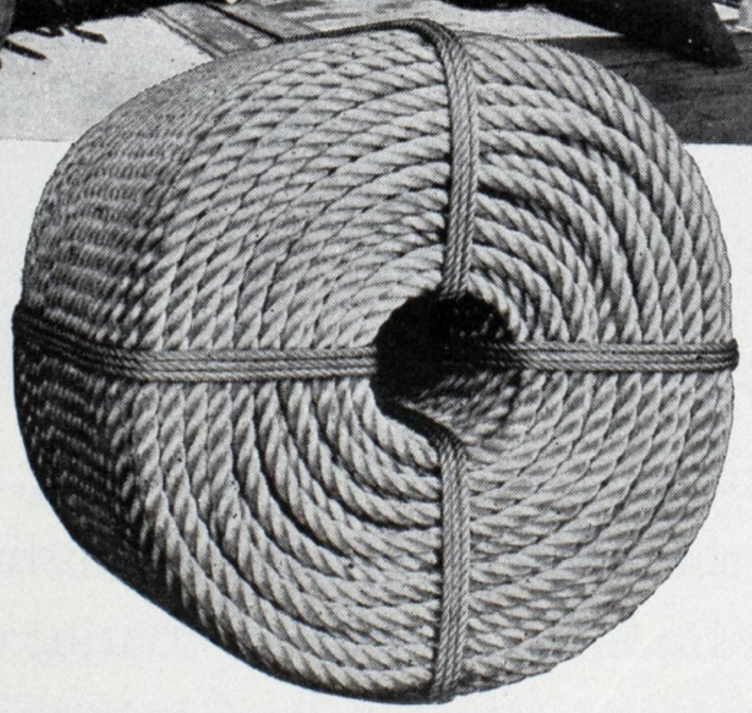

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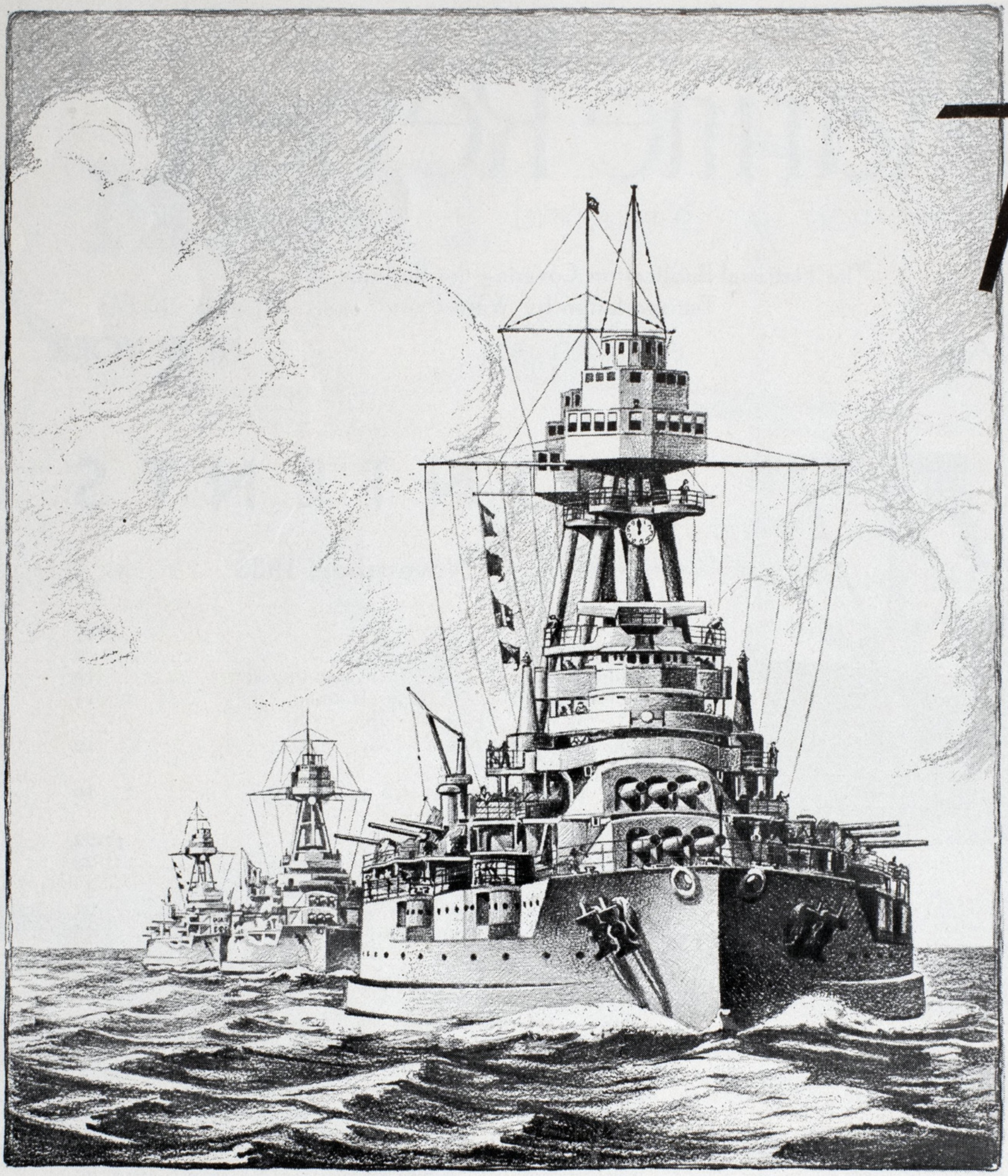

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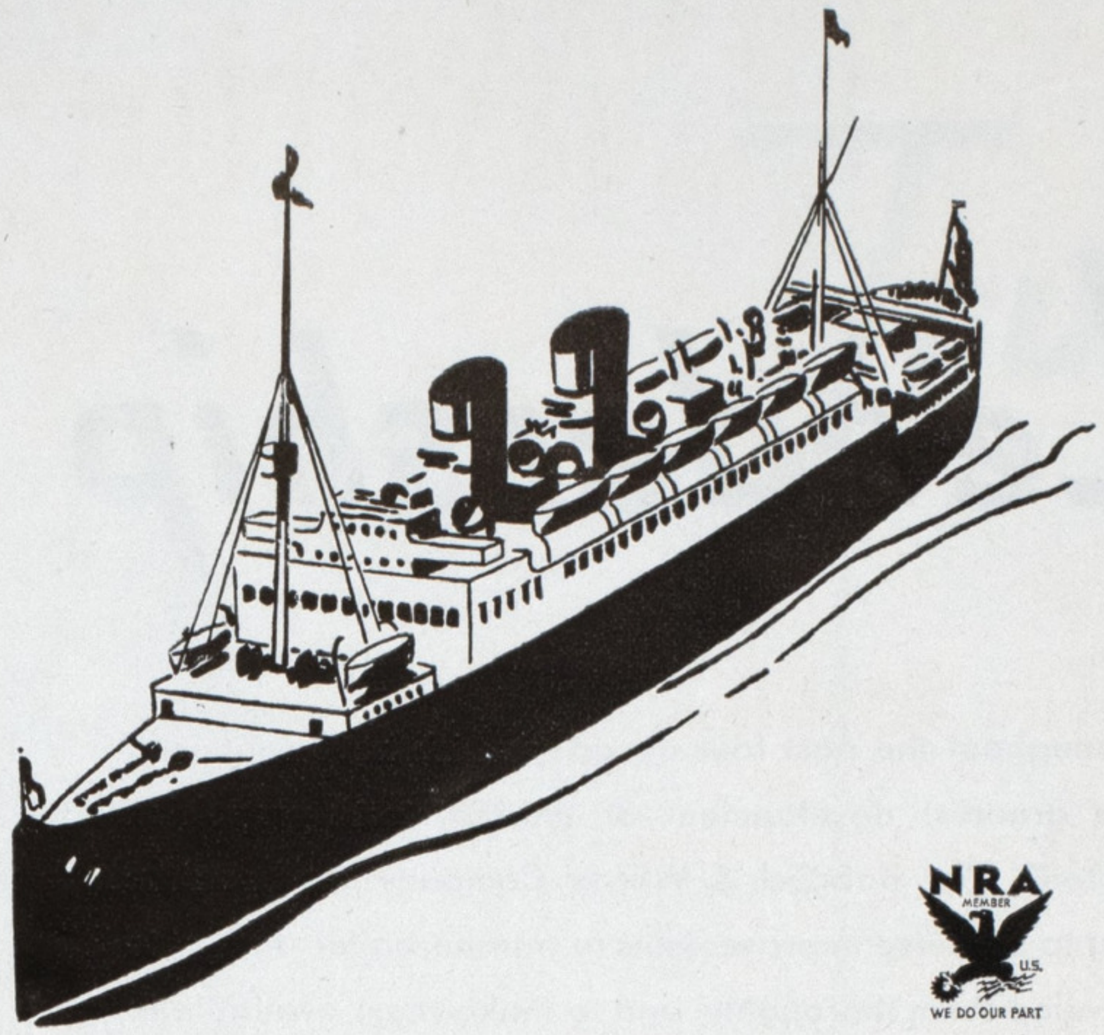

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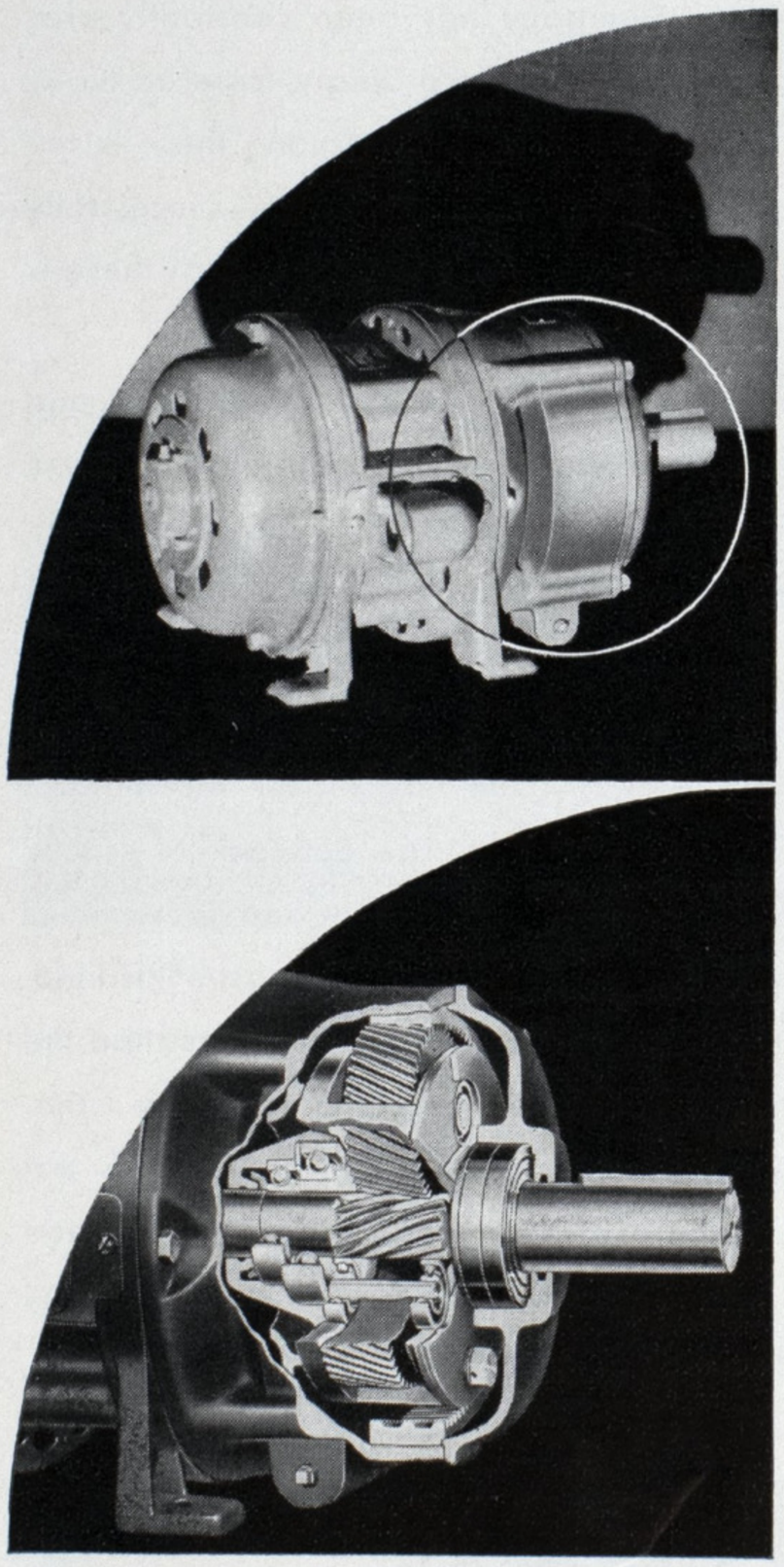

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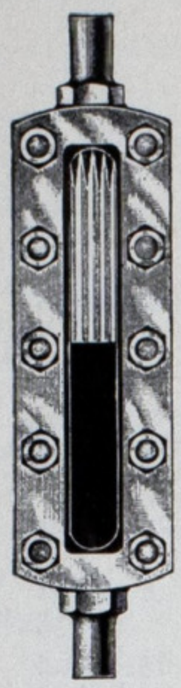

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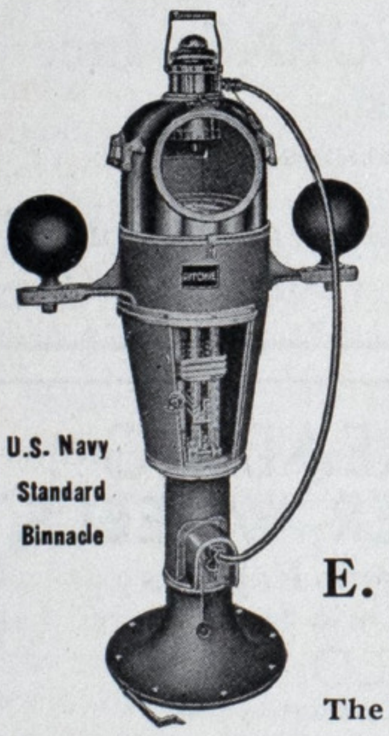

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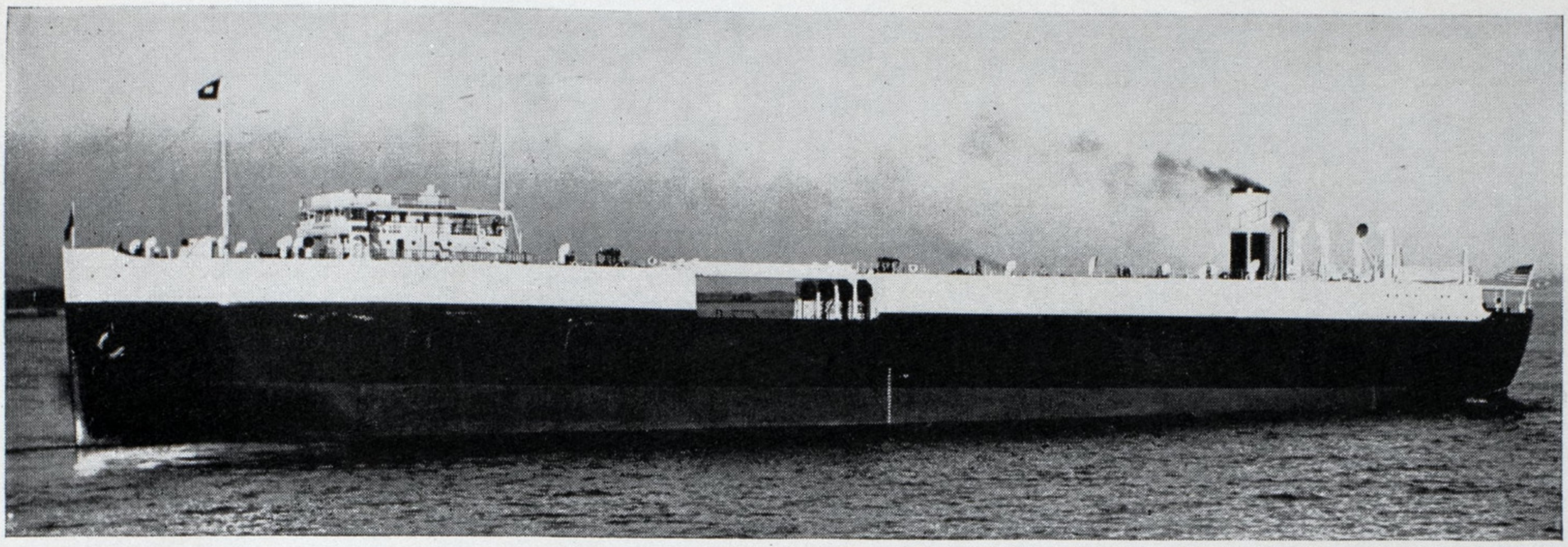

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In addition, we do Drydocking and all kinds of Marine Repairs.

SUN SHIPBUILDING & DRY DOCK CO.

Chester, Pa. **25 Broadway, N. Y.**

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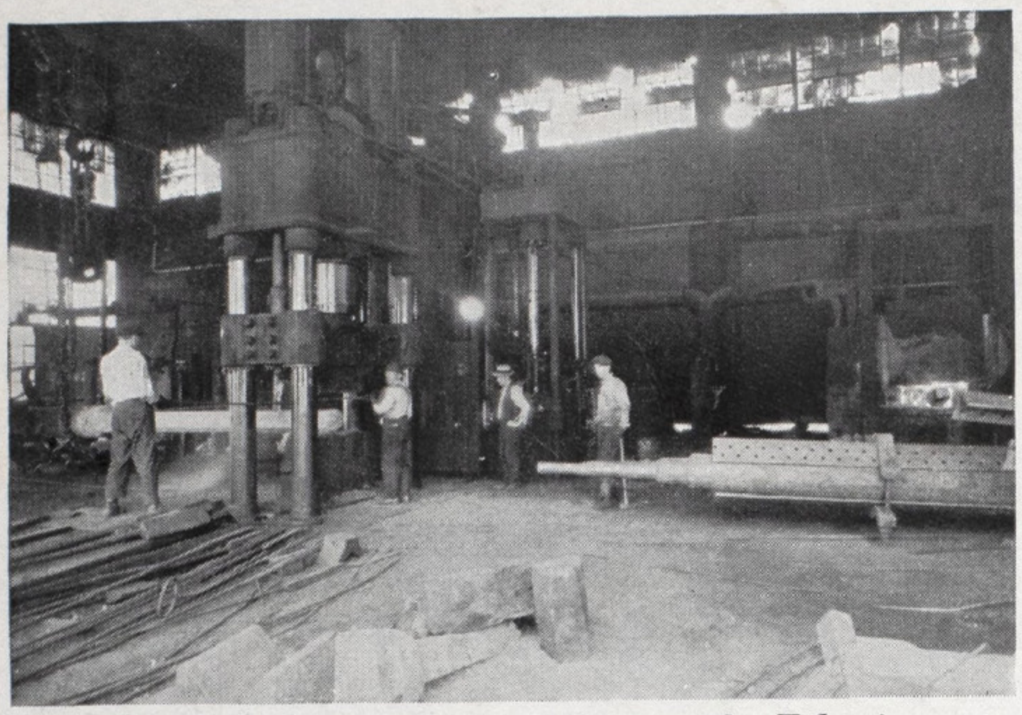
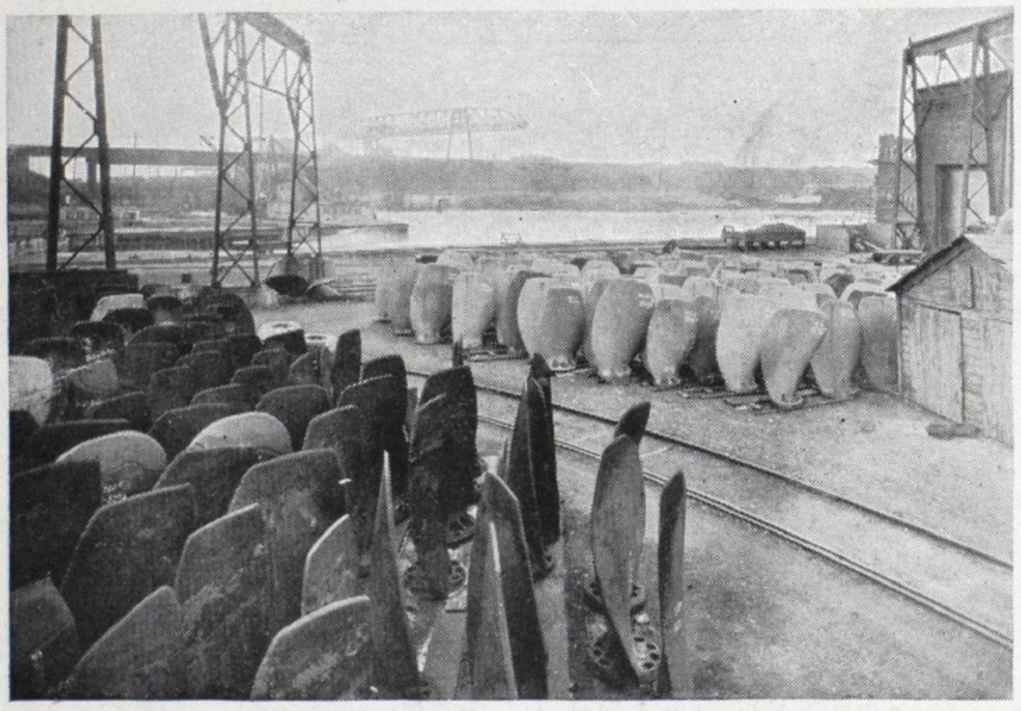


Here is a typical forge press in one of our yards. Takes ingots up to 2 feet, 6 inches.



Propeller blades by the battalion are available for quick repairs.

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The AMERICAN SHIP BUILDING CO.

Main Office: Foot of West 54th Street, Cleveland, Ohio

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